

Evolution of a Systems View of Research and Innovation Impacts, Relationships, and Contexts

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With contributions from Steve Montague



360 Innovation LLC



The thinking and approaches used to evaluate RTD and innovation programs have evolved

- Brief review of the evolution of evaluation of RTD and innovation
 - Strong co-evolution of the approaches
 - Move from a set of abstract metrics used in the mistaken view that one can ‘sum the accounts’ towards an approach that recognizes the unique value of RTD and innovation initiatives on a case by case (issue by issue), *social* science and complex systems basis.
 - Progress has been made in modeling archetypical RTD programs and understanding.
- Focus on the key lessons to be learned, the importance of
 - Reach, relationships
 - Linking theory of action and theory of change (outcomes)
 - Context for both

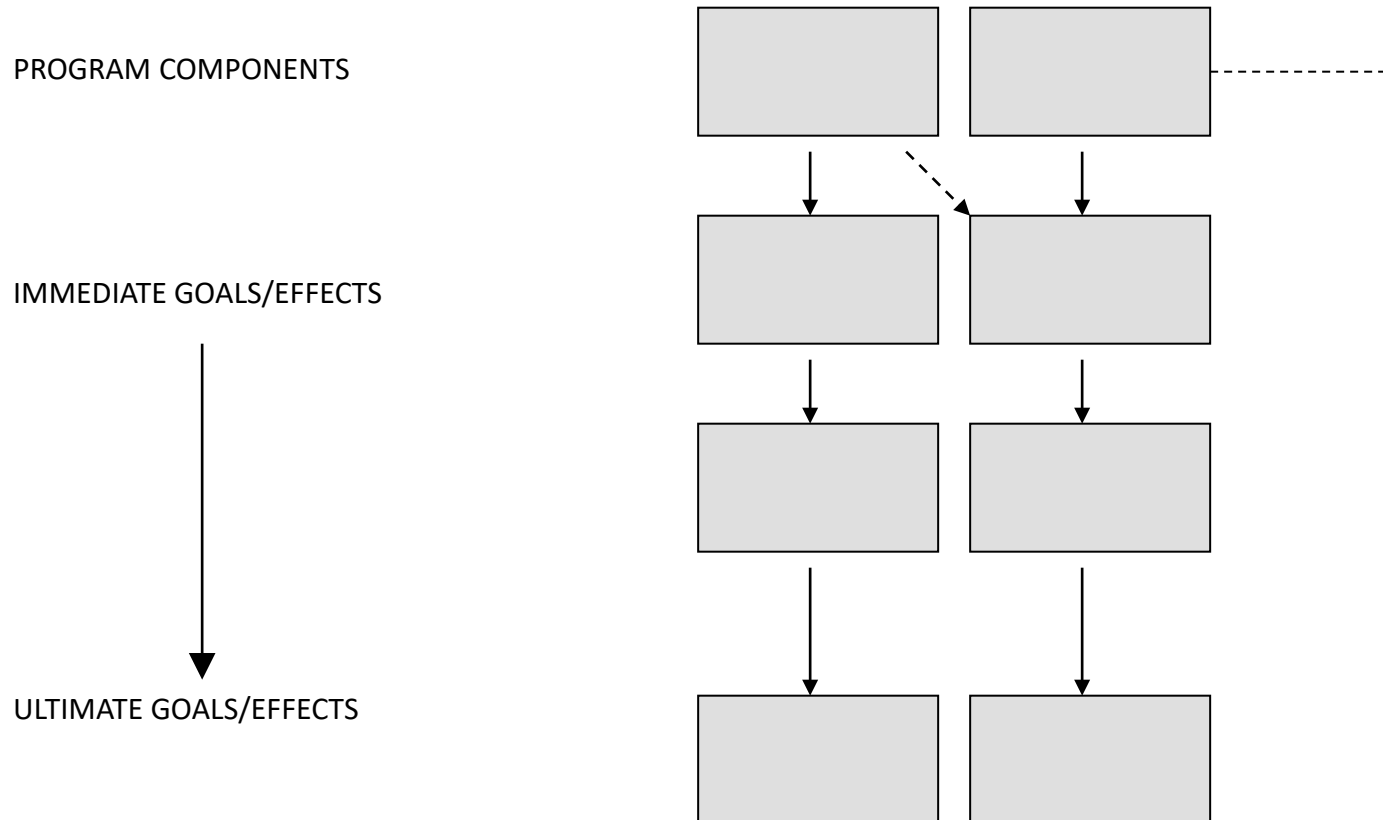
1999 Conclusion:

Scope of Logic Modeling has evolved to include more aspects of the program and its context

- began with inputs and outcomes
- outputs added and outcomes separated
- describe objectives hierarchies
- customer and partner reach emphasized
- performance frameworks stress intermediate outcomes, meeting customer needs
- more complex, show shared responsibility
- align objectives and logic for an organization

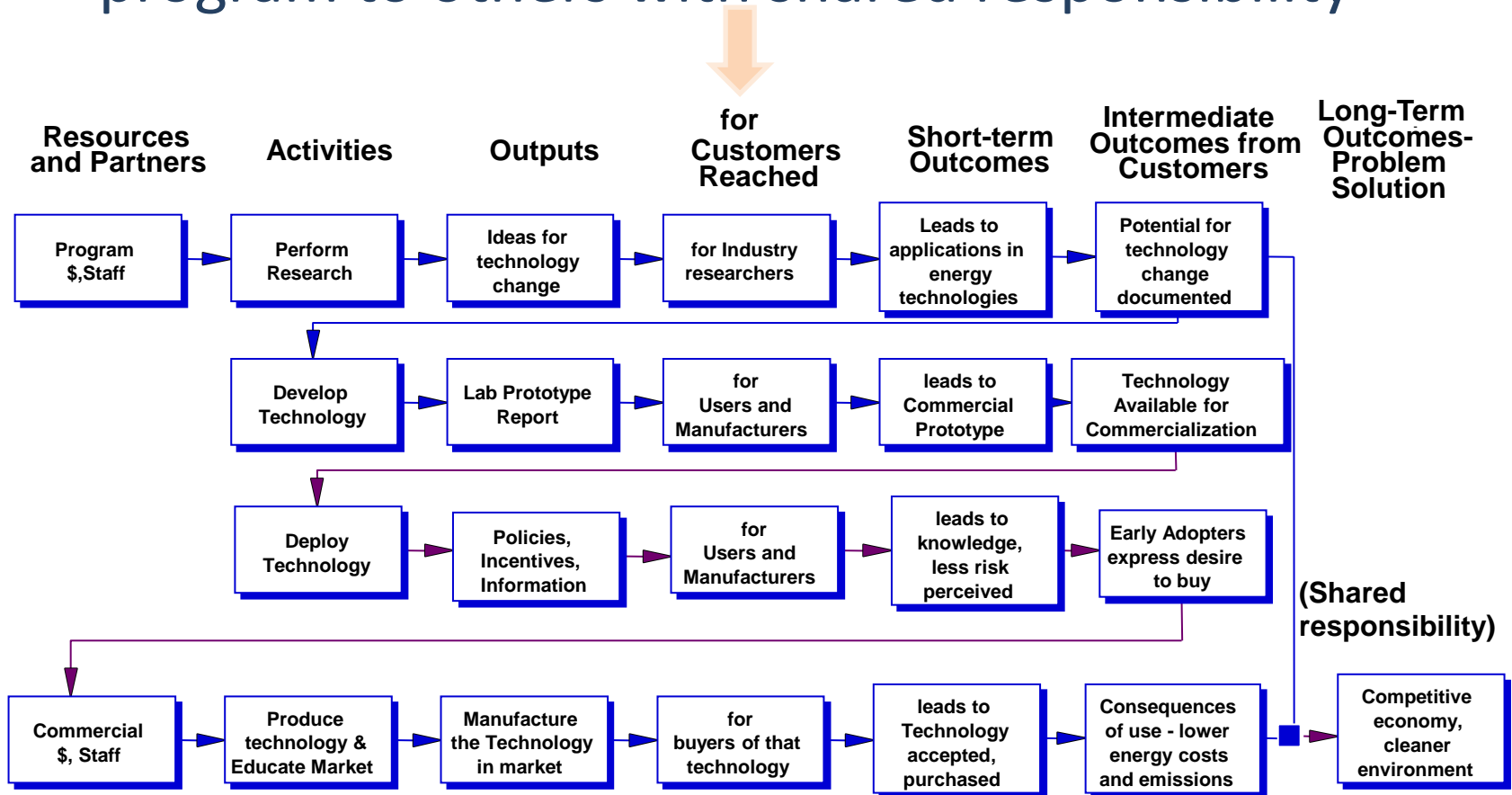
Source: Jordan 1999 AEA talk

Basic structure of early program model for evaluability assessment



Source: Wholey in Rush and Ogborne, 1991

More complex logic charts show sequential flow from program to others with shared responsibility



External Influences: Price of oil and electricity, economic growth in industry and in general, perception of risk of global climate change and need for national energy security, market assumptions, technology assumptions

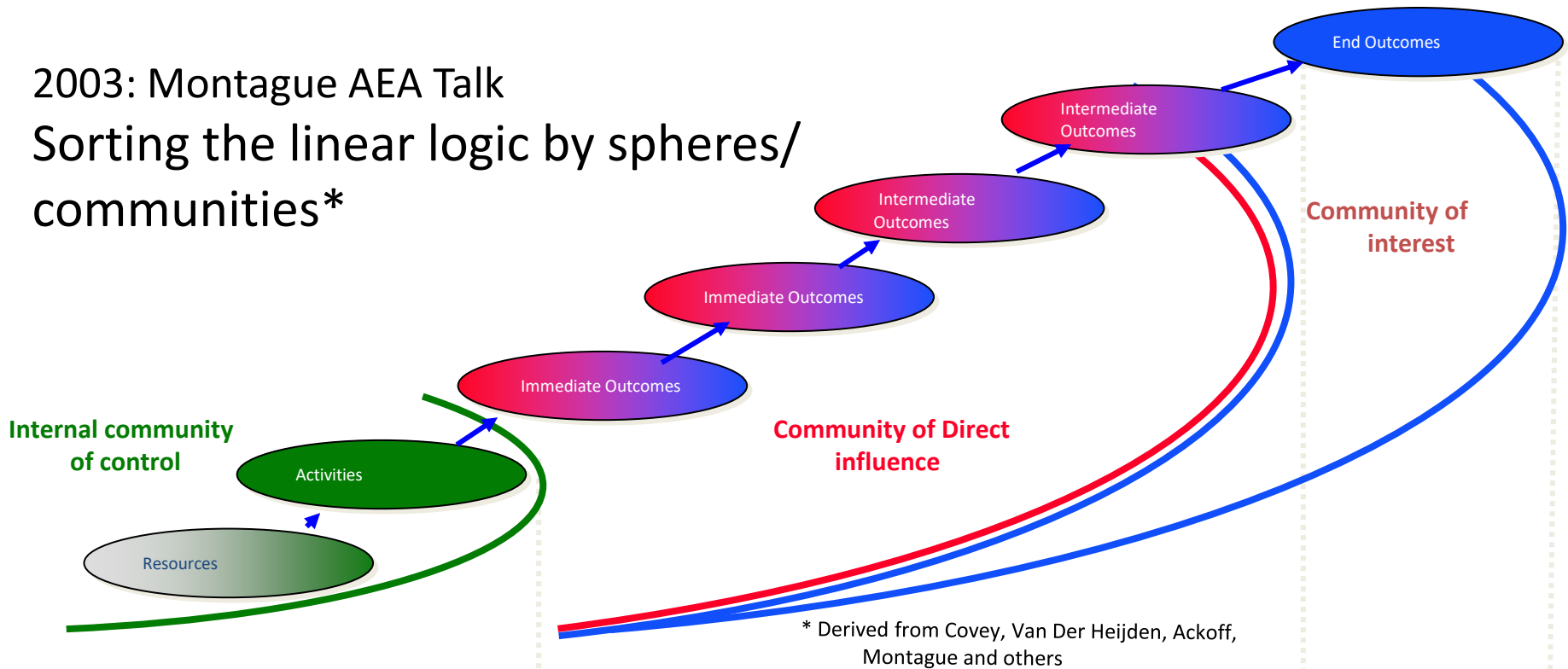
Source: McLaughlin and Jordan, 1999

Progress in describing the system of RTD/ Innovation

- Components (operating parts):
 - Actors
 - Institutions
 - Infrastructure
 - Actions, Interactions (networking)
- Relationships (links between components)
- Attributes (properties of the System's dimensions)

2003: Montague AEA Talk

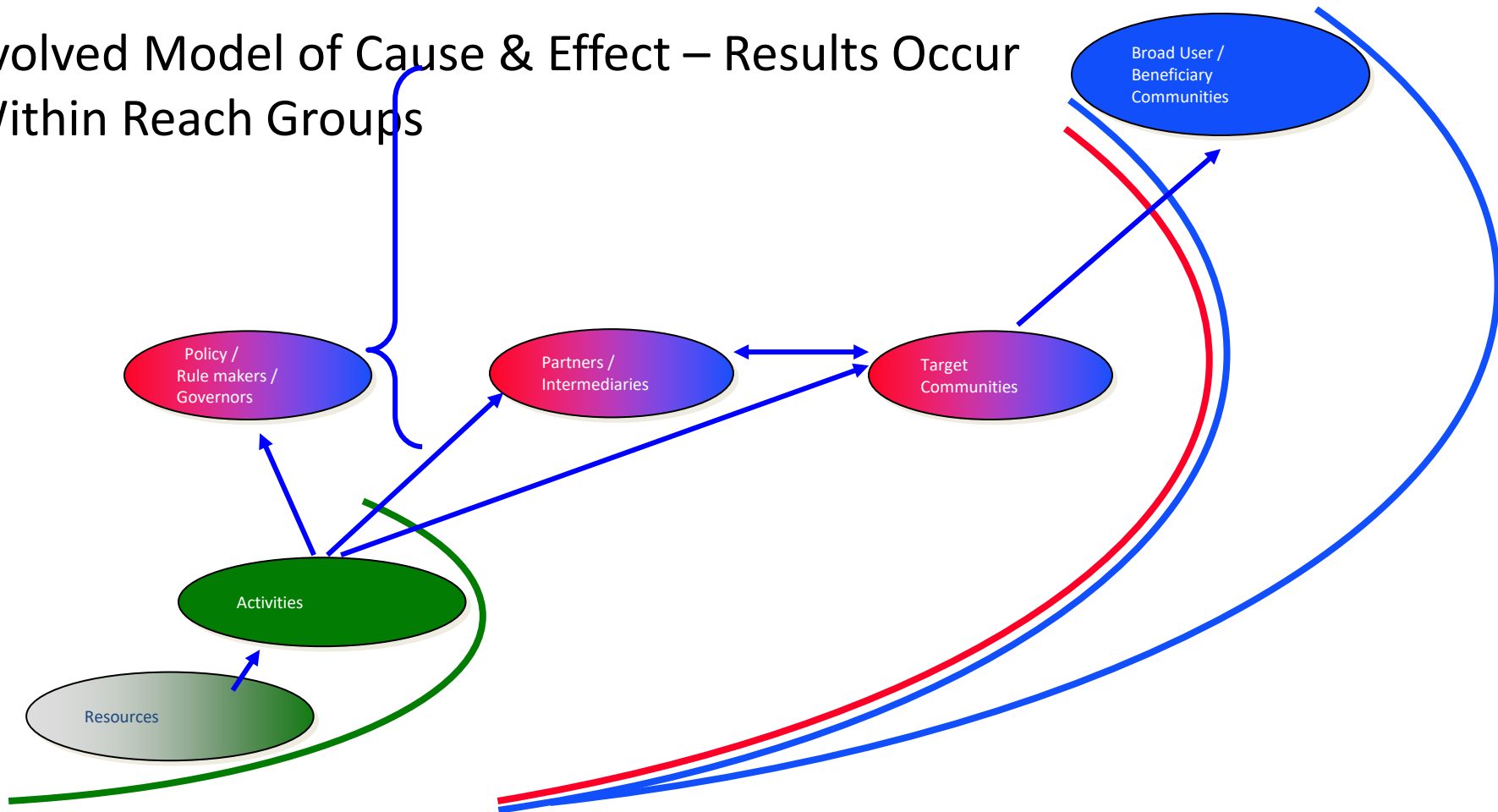
Sorting the linear logic by spheres/ communities*



* Derived from Covey, Van Der Heijden, Ackoff, Montague and others

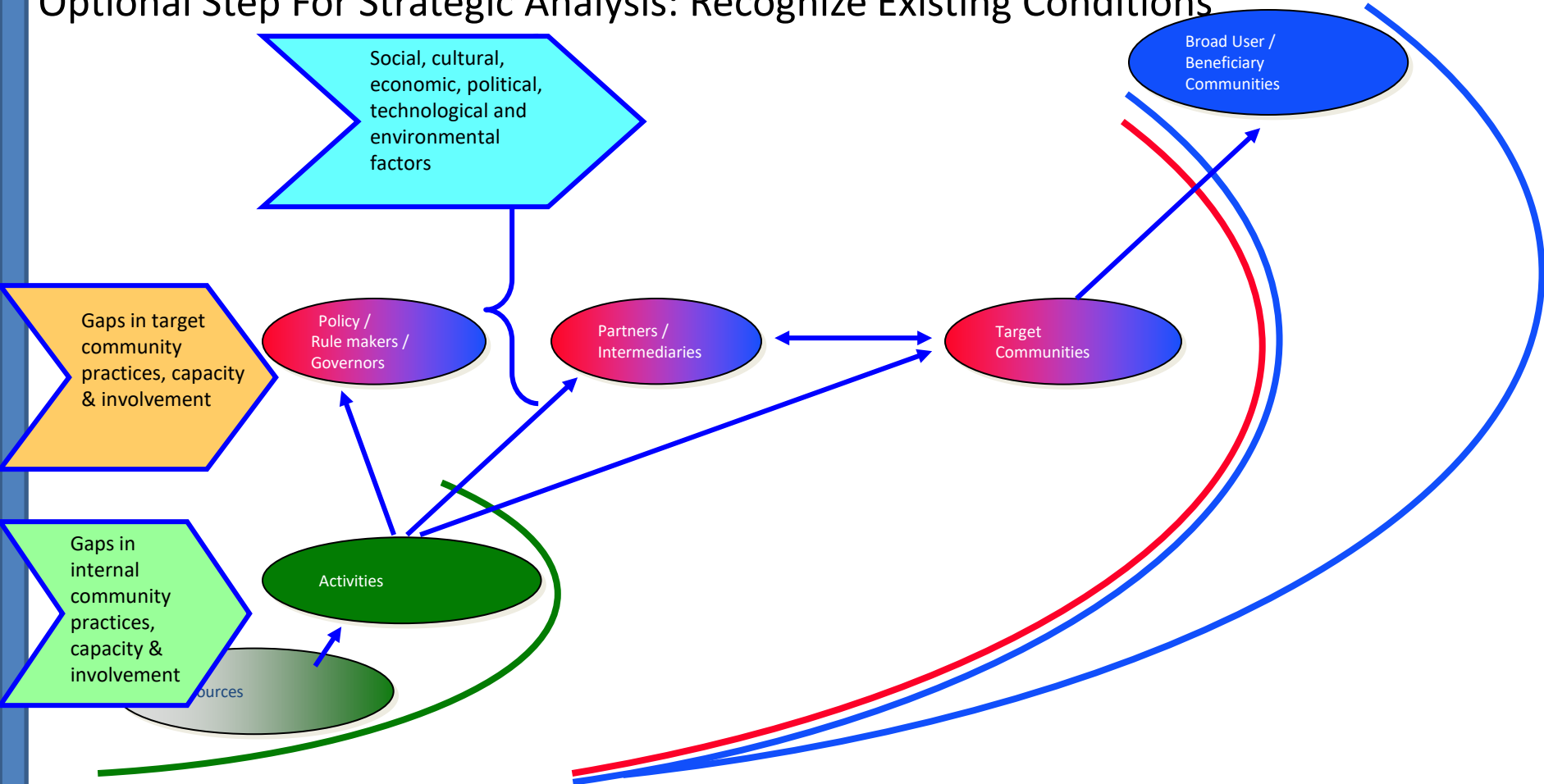
HOW should this be undertaken?		WHO do we work with?	WHAT results do we want?		WHY should we do this?
RESOURCE IMPLICATIONS	ACTIVITIES / OUTPUTS	REACH	IMMEDIATE OUTCOMES	INTERMEDIATE OUTCOMES	END OUTCOMES

Evolved Model of Cause & Effect – Results Occur Within Reach Groups



Slightly more evolved results logic begins to show the reach and influence of intermediaries and partners in contributing to the achievement of end outcomes in the broader communities of interest.

Optional Step For Strategic Analysis: Recognize Existing Conditions



Once key groups, the results logic and relationships have been considered, it is useful to consider the effects of outside factors. This provides a specific focus for the environmental scanning activity.

Towards an integration of systems thinking into results logic for S&T and innovation initiatives

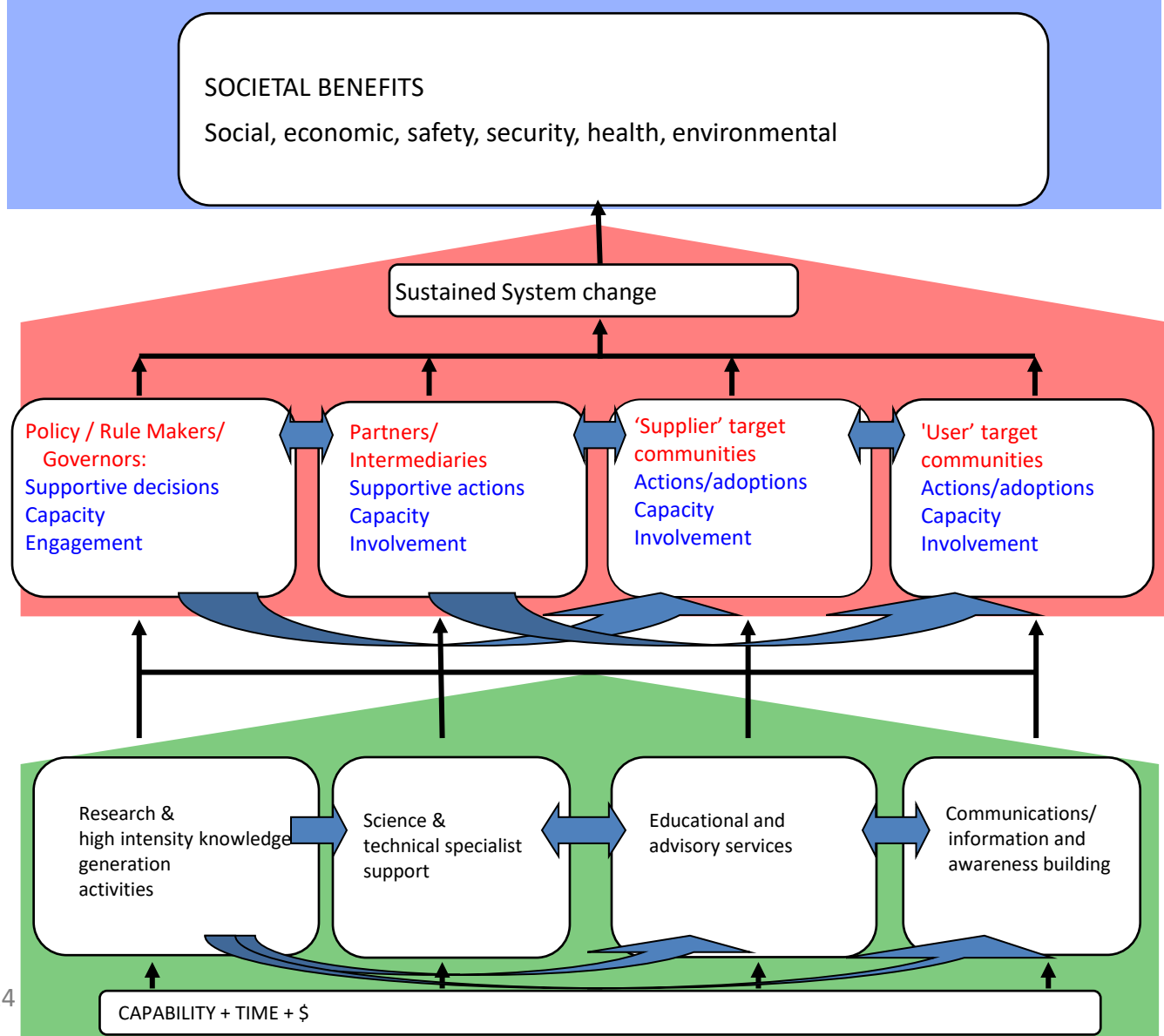
Steve Montague
November 7, 2003

Recognizing the relationship chain (or network) as well as the results chain can help gain perspective on the systems in 'play' for any given program, policy or initiative.

WHY we exist

WHO we reach & WHAT we want

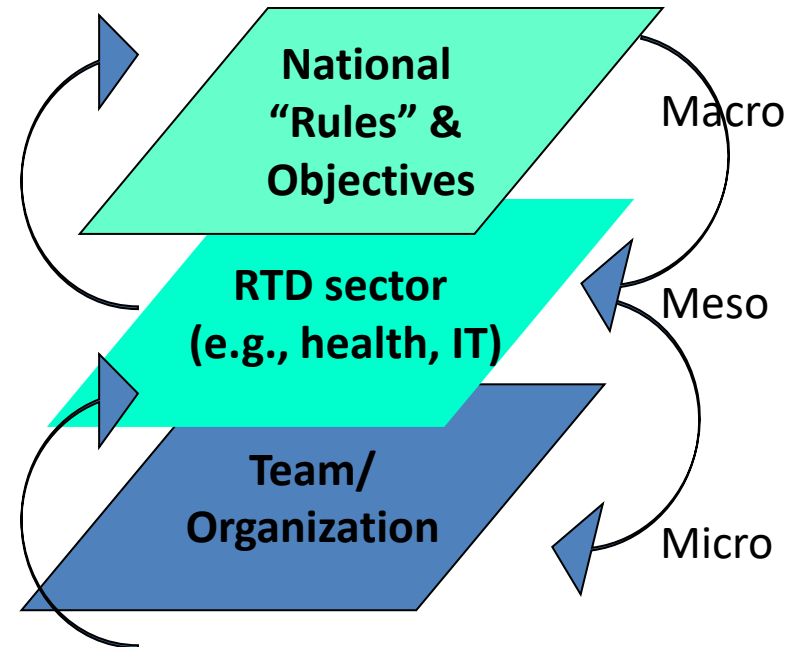
HOW we operate



Systems level evaluation requires analyzing 3 levels (Arnold 2004)

Meso level is important because

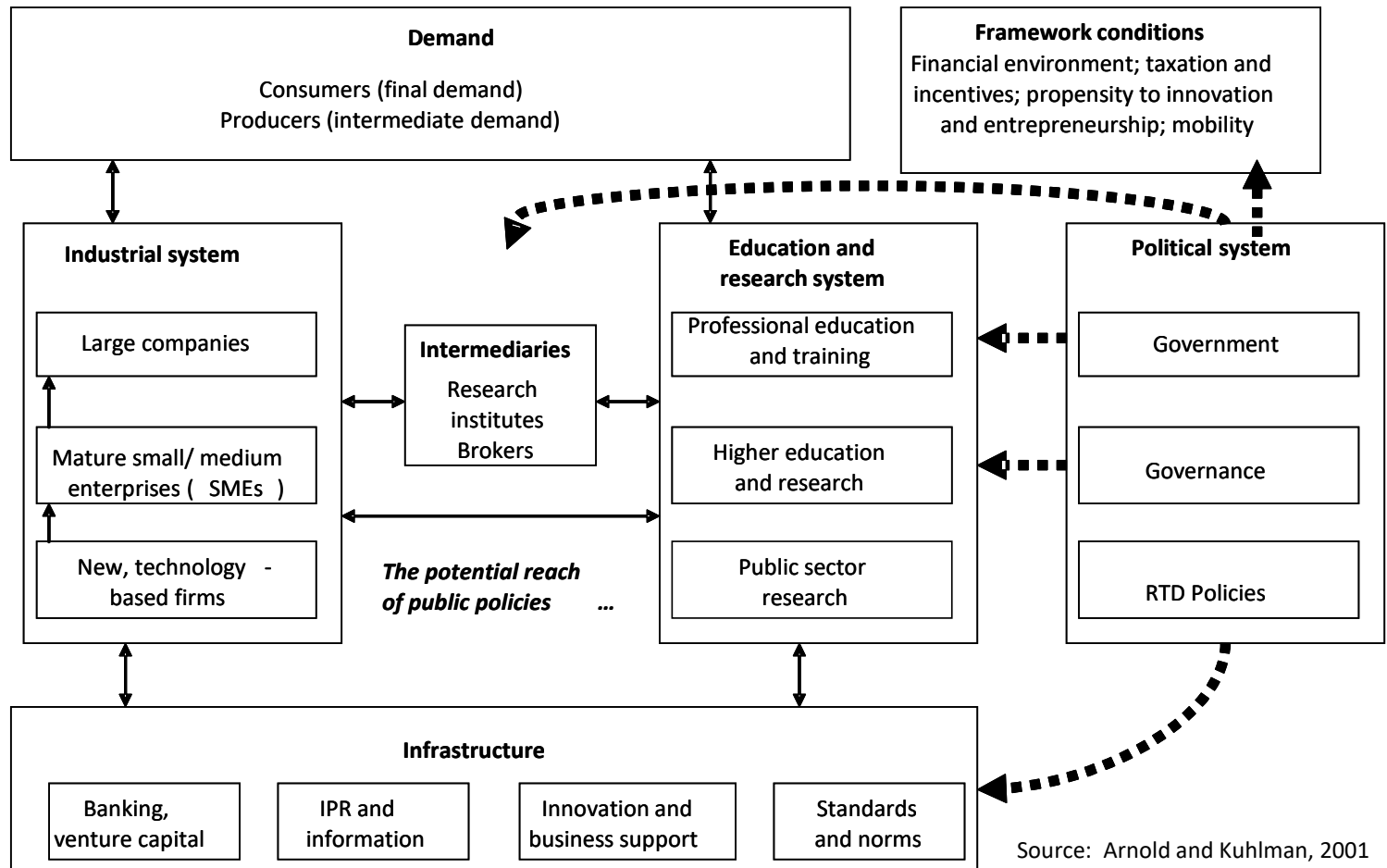
- Program outcomes/ impacts differ by sectors because sectors differ in
 - Amount of investment for types of RTD
 - Rates of technical change
 - Ease of adoption
- Mission, policy and programmatic decisions are often sector specific
- Bottlenecks can be spotted more easily here.



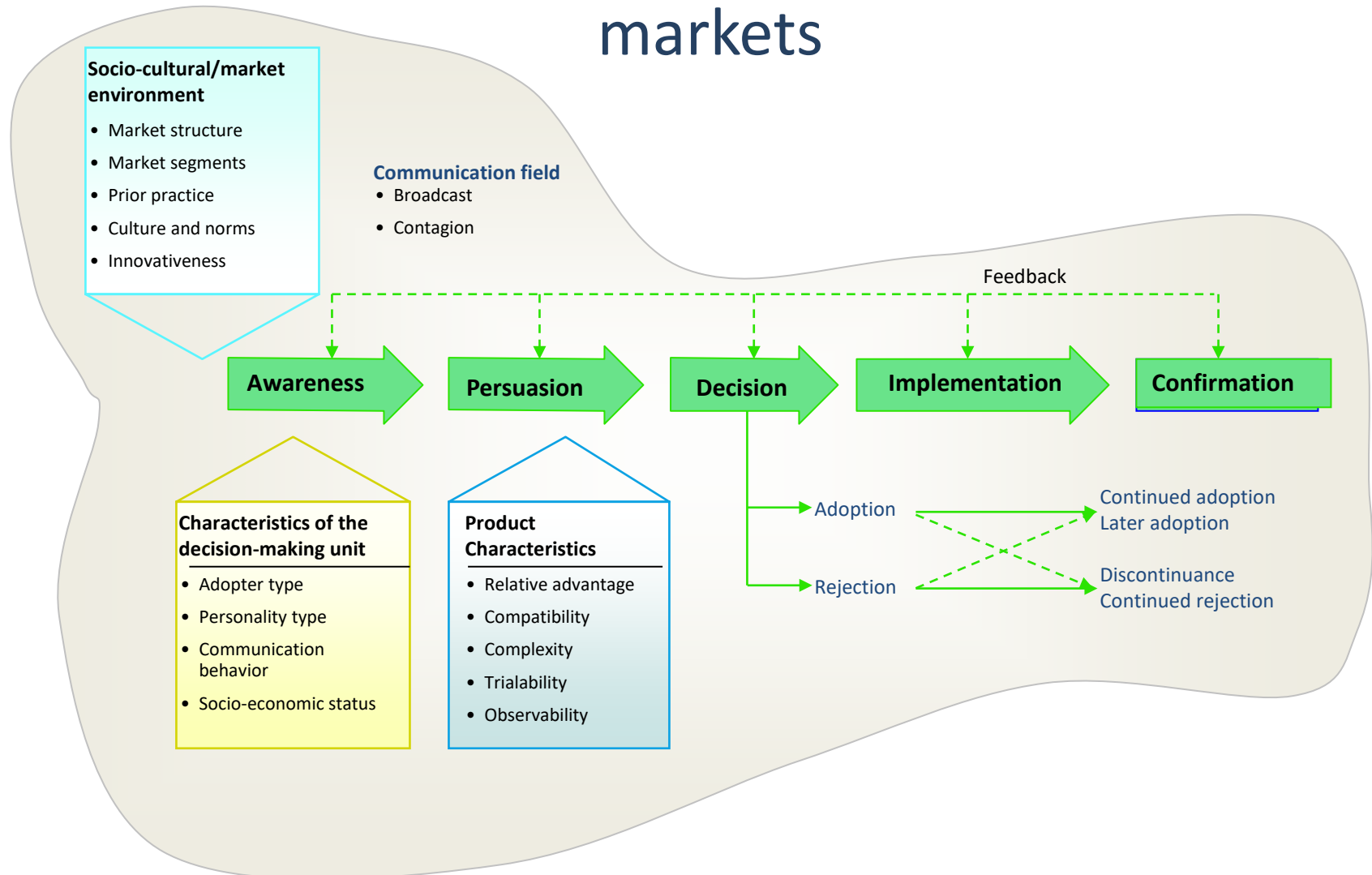
References: Arnold, E. (2004). Jordan, G. B., Hage, J., & Mote, J. 2008

A National Innovation System model looking at relationships among institutions

A National Innovation System Model

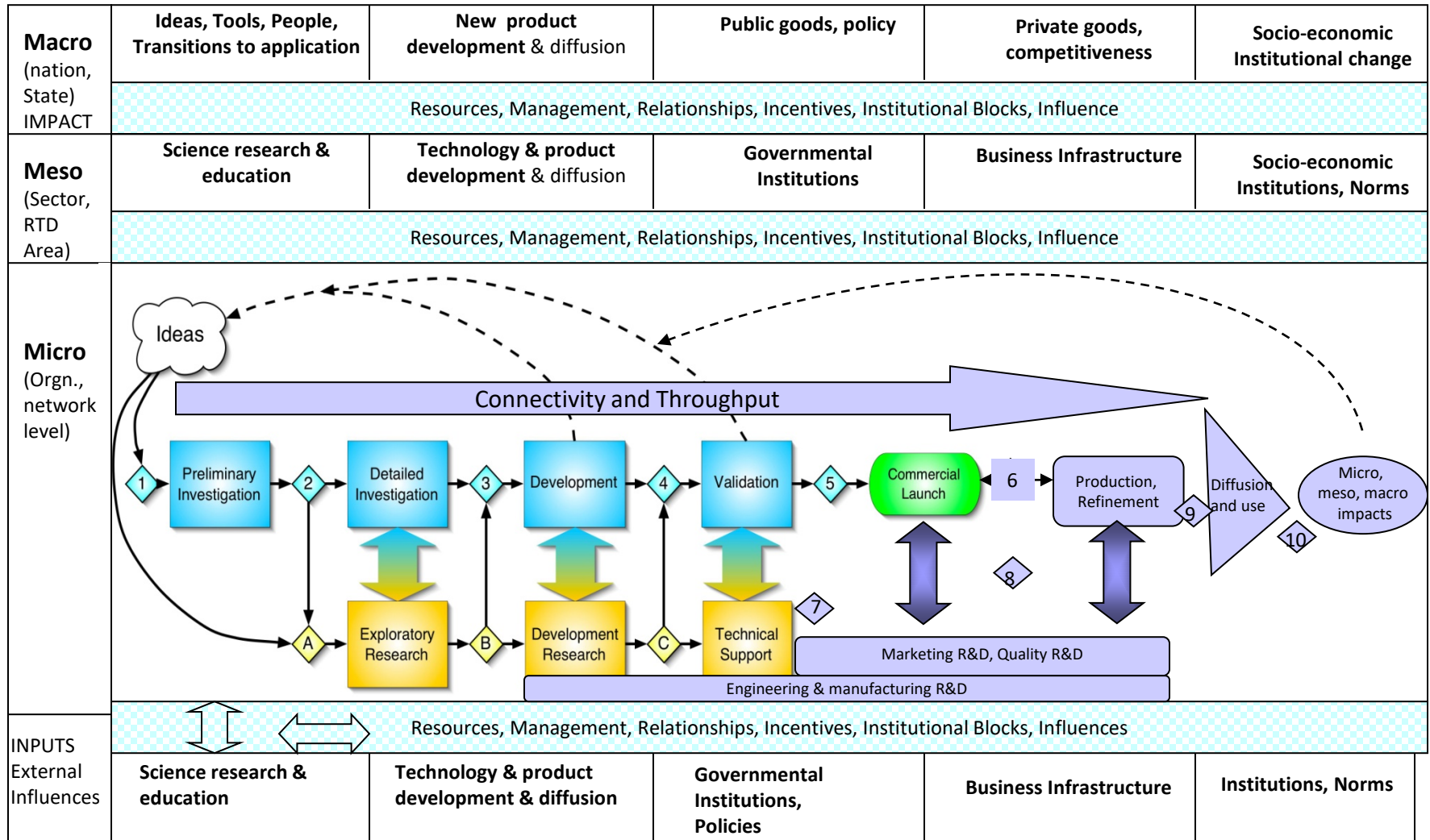


Building on Existing Theories: Rogers' diffusion theory organizes thinking about complex markets

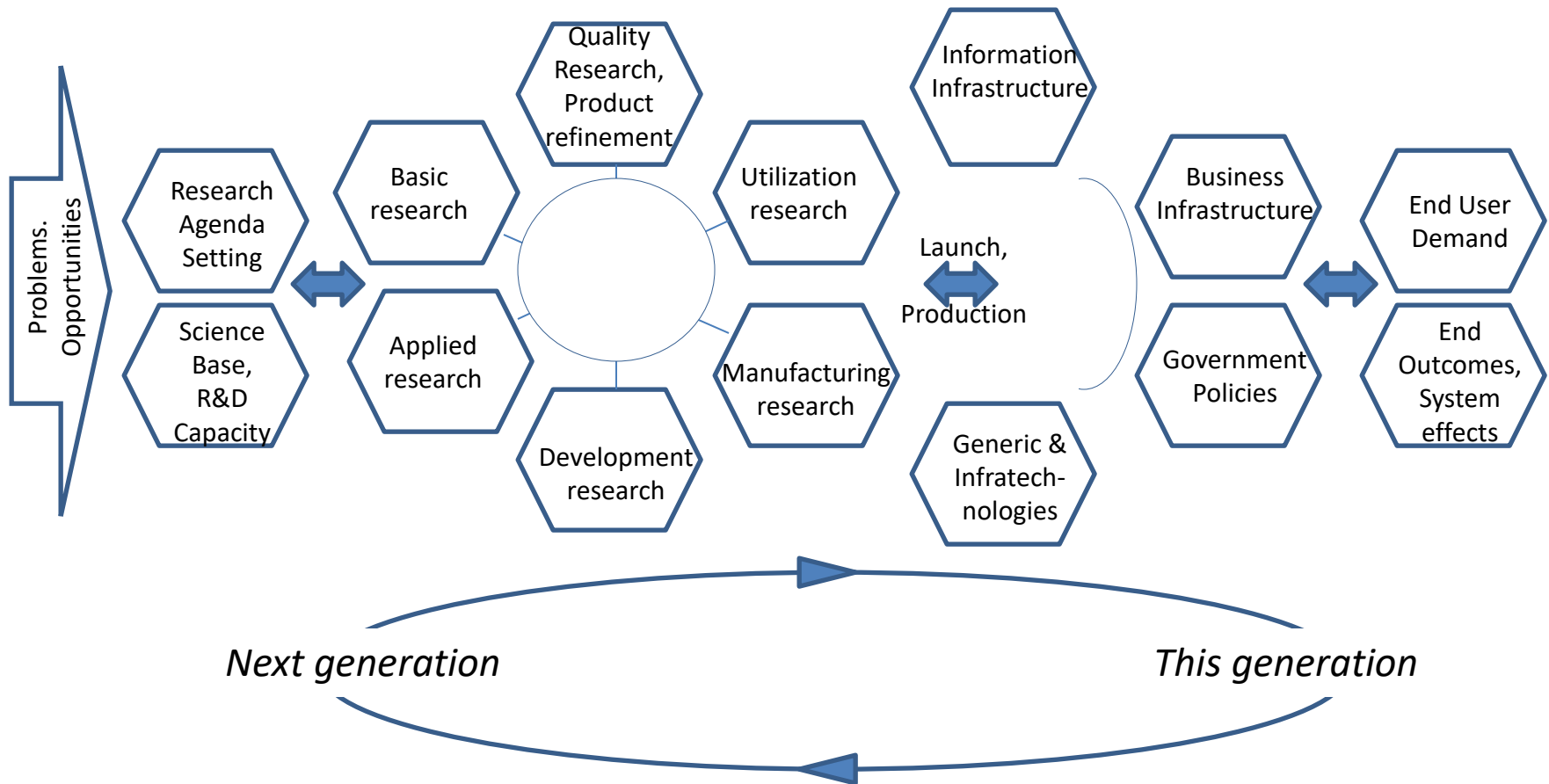


2005: Multiple levels of influence and assessment within an emergent RTD system

Draft 10/20/2005
G. Jordan



2010: RTD and Diffusion together in one logic diagram



Evaluation Approaches

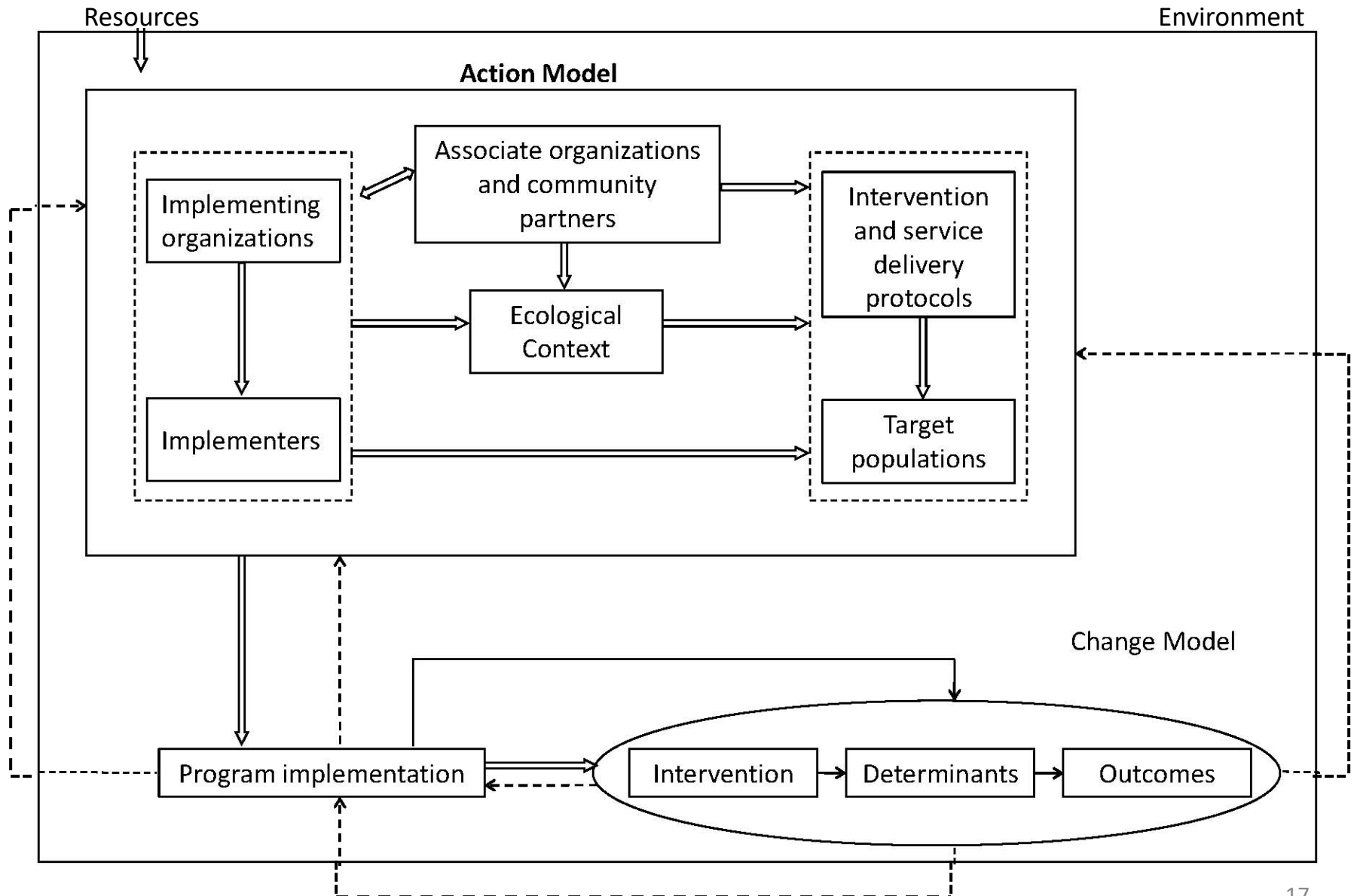
Key Lessons

- Implementation activities, design and delivery matter a lot (even for impact evaluations)
 - Need to explicitly include theories of implementation/action with theories of change
 - Need to look at each – *then how they interact together*
- New evaluation design implications
 - Generative approaches (do homework first, then lay out explicit expectations)
 - Process and impact evaluations done together
 - Common key factors and assumptions for both implementation and change theory should be considered
 - Stronger context, communication and engagement emphasis

Source: Does Your Implementation Fit Your Theory of Change? Key Insights From Evaluation Practice

http://evaluationcanada.ca/distribution/20140616_montague_steve.pdf

Chen's Conceptual Framework of Program Theory (Comprehensive Form)

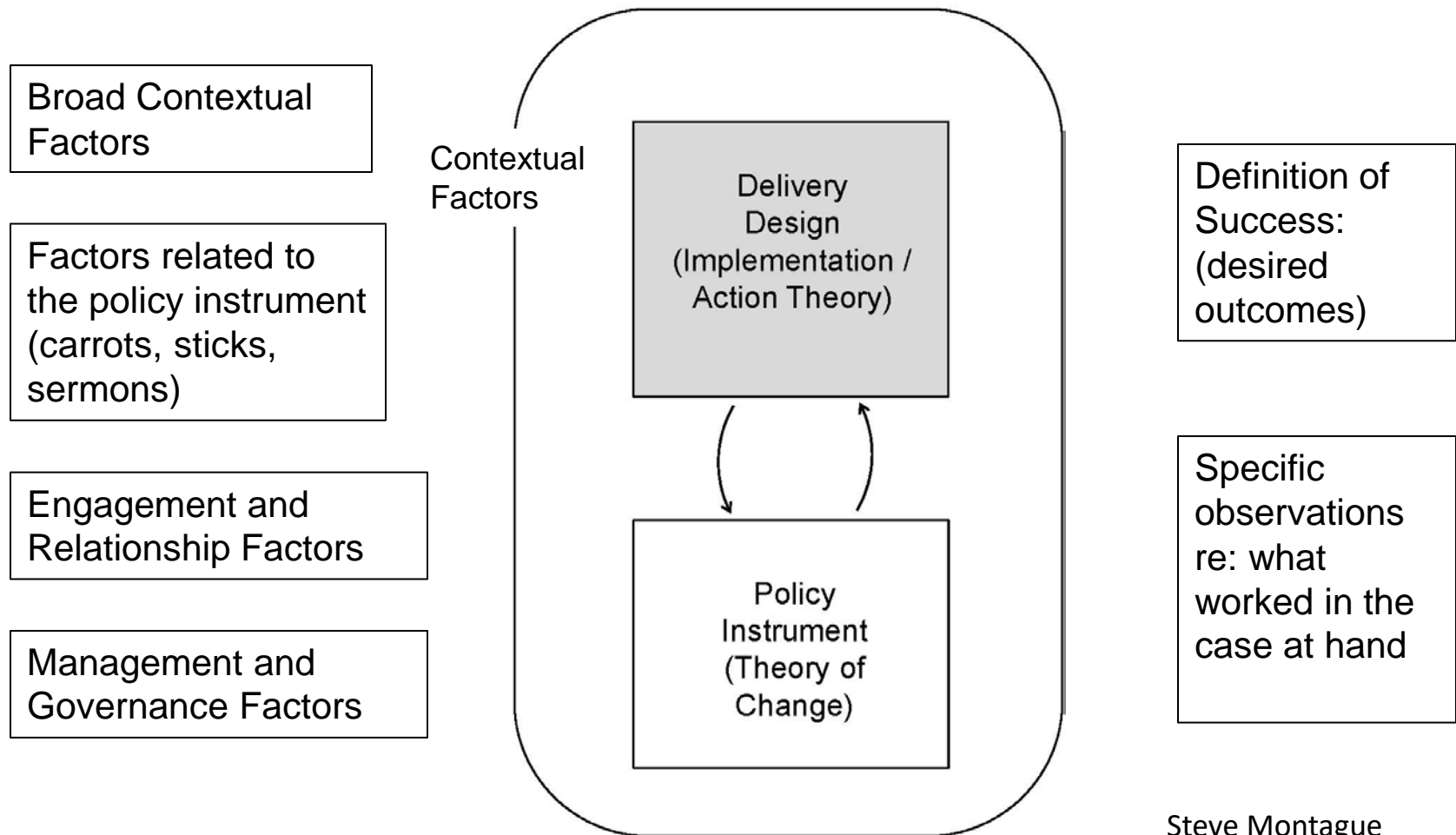


Source: Montague, 2014; Chen, H.T. (2005) Practical Program Evaluation Sage Publications pg 31

What Montague has tried and found successful

- Extracted the implementation theory from a conventional logic model
- Lined it up with the change theory
- Drew from research, experience and analysis key assumptions and enabling factors
- Tested those

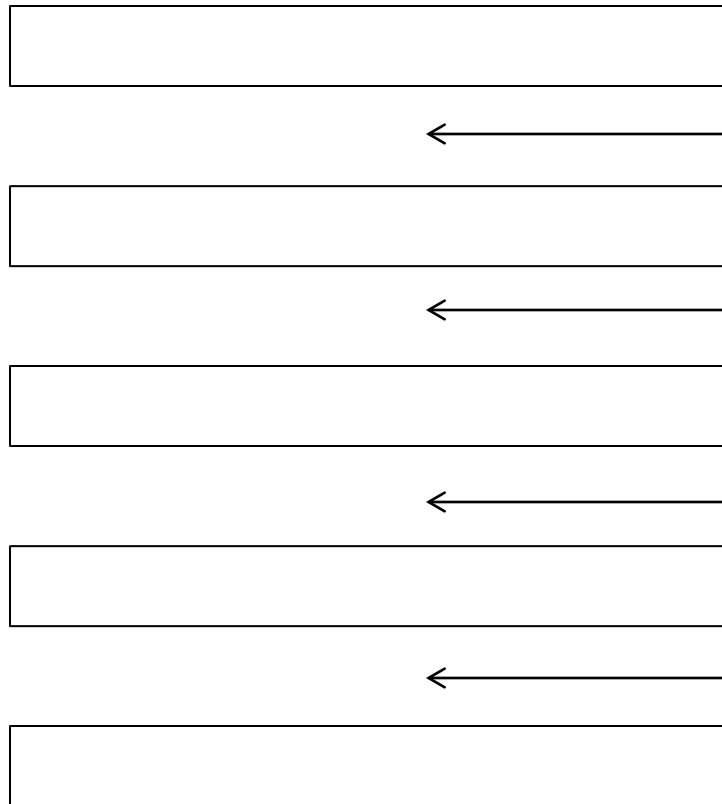
Basic Framework for Assessing What Works in Policy, Programs and Delivery



Steve Montague

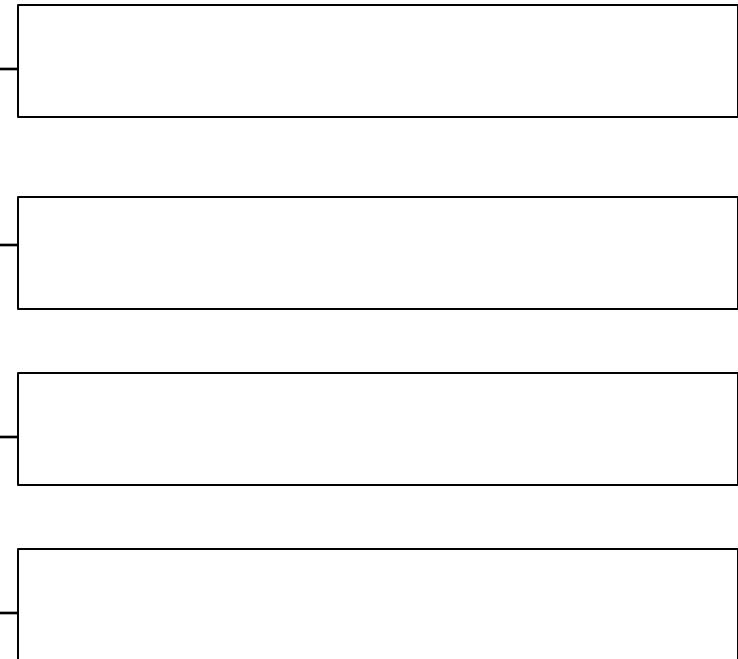
Contribution Analysis Approach (Montague)

Results Chain



Assumptions/ External Factors

!! = Major variance ! = Limited variance ? = unknown



When you have enough !!s – the factors pile up and you fail!!

Sources: Montague 2014; Mayne (various 1999 - 2012), Government of Canada Theory-Based Approaches to Evaluation: Concepts and Practices (2012)

For an example see Wimbush, E., Montague, S. and Mulherin, T. (2012). *Applications of Contribution Analysis to Outcome Planning and Impact Evaluation* Evaluation Volume 18 Issue 3, July 2012

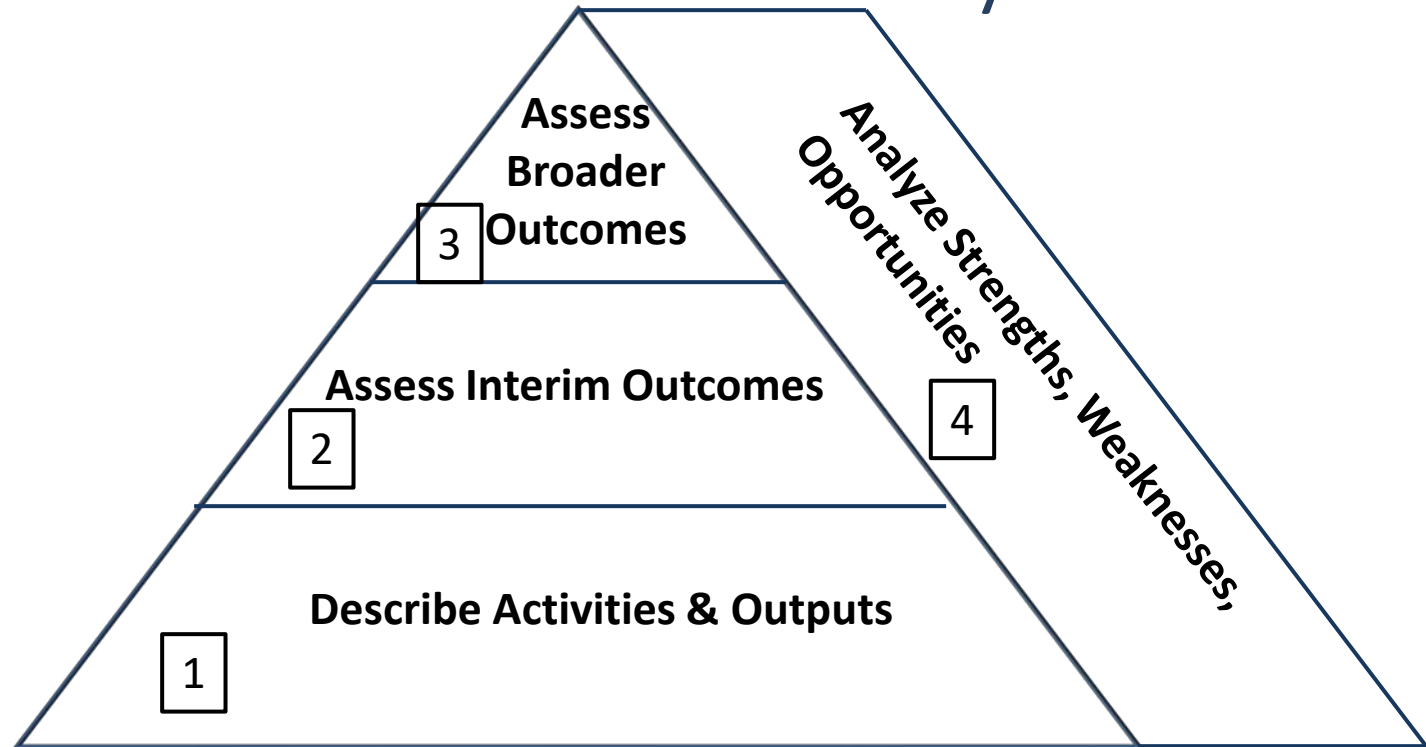
What U.S. DOE and others have tried

- Chronological attribution matrix
- Combining some process with impact evaluation with four tiers of analysis
- Mayne's contribution analysis
- Standardized case studies
- RTD TIG's proposal for a set of generic RTD logical frameworks

Matrix for Explaining DOE Influence

Categories of Information Needed for Additionality Assessment	Technology Timeline (Stage of Research, Development, and Commercialization)→					
	Preliminary & detailed investigation	Develop components	Develop system	Validate/ demonstrate	Commer- cialize	Market Adoption
History of the technology						
What DOE Did						
What Others Did (Rival Explanations—Private Sector and Other Nations)						
What Others Did (Rival Explanations –US & State Government)						
The DOE Effect						
Description of DOE Influence And its strength						
Basis of evidence of influence						

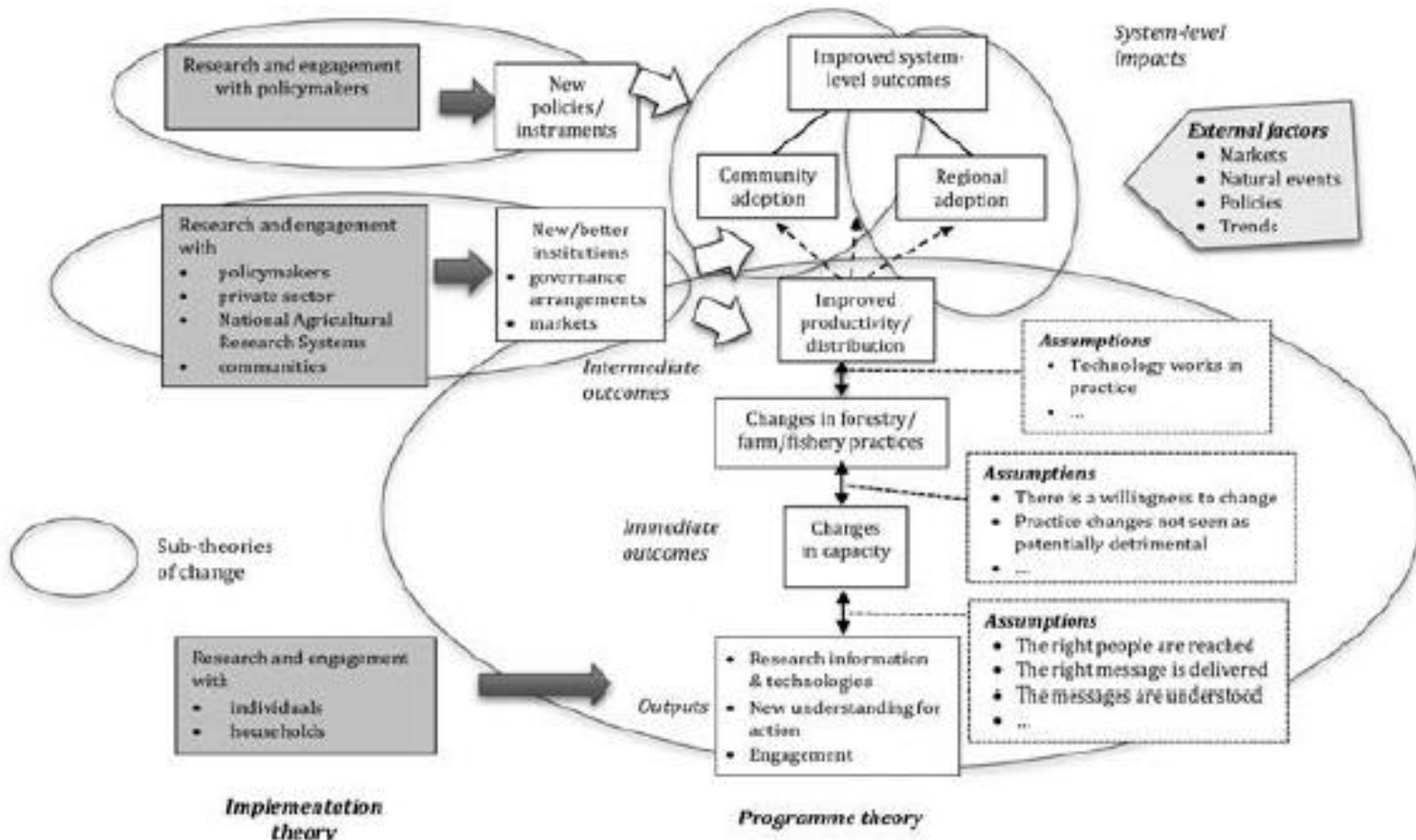
Recent US DOE framework combines interim outcome assessment with formative questions in four tiers of analysis



Evaluate Tier 1, then 2, then 3, then 4.
Each tier builds on the tier(s) before it.

Source: Jordan, Ruegg, et.al. A Framework for Evaluating R&D Impacts and Supply Chain Dynamics Early in a Product Life Cycle, 2014.

Mayne and Stern: An Indicative Theory of Change for Natural Resource Management Research Programs



Mayne J. and Stern E. 2013. *Impact evaluation of natural resource management research programs: a broader view*. ACIAR Impact Assessment Series Report. aciar.gov.au/files/ias84.pdf

Example of standardized case studies

- Standardized case studies share a common framework and characterize key aspects of a program and its context, so study data can be aggregated and hypotheses tested with combined data (French National Institute for Agronomic Research (INRA))
- Tools standard across the studies
 - Chronology: time frame, main events, turning points
 - Impact Pathway: productive intermediaries/interactions, contextual factors
 - Impact Vector: Radar chart of impact dimensions
- Identified
 - Production of actionable knowledge, Lag before impact
 - Program roles on two dimensions: Upstream or downstream and Exploring new options or insuring existing.

Joly, Pierre-Benoit, Laurence Colinet, Ariane Gaunand, Stéphane Lemarie, Phillipe Laredo, Mireille Matt, (2013). A return of experience from the ASIRPA (Socio-economic Analysis of Impacts of Public Agronomic Research) project. www.fteval.at/upload/Joly_session_1.pdf and http://www6.inra.fr/asirpa_eng/ASIRPA-project.

Evaluating Outcomes of Publicly Funded Research, Technology and Development Programs: Recommendations for Improving Current Practice

Version 1.0 Draft Final

October 2014

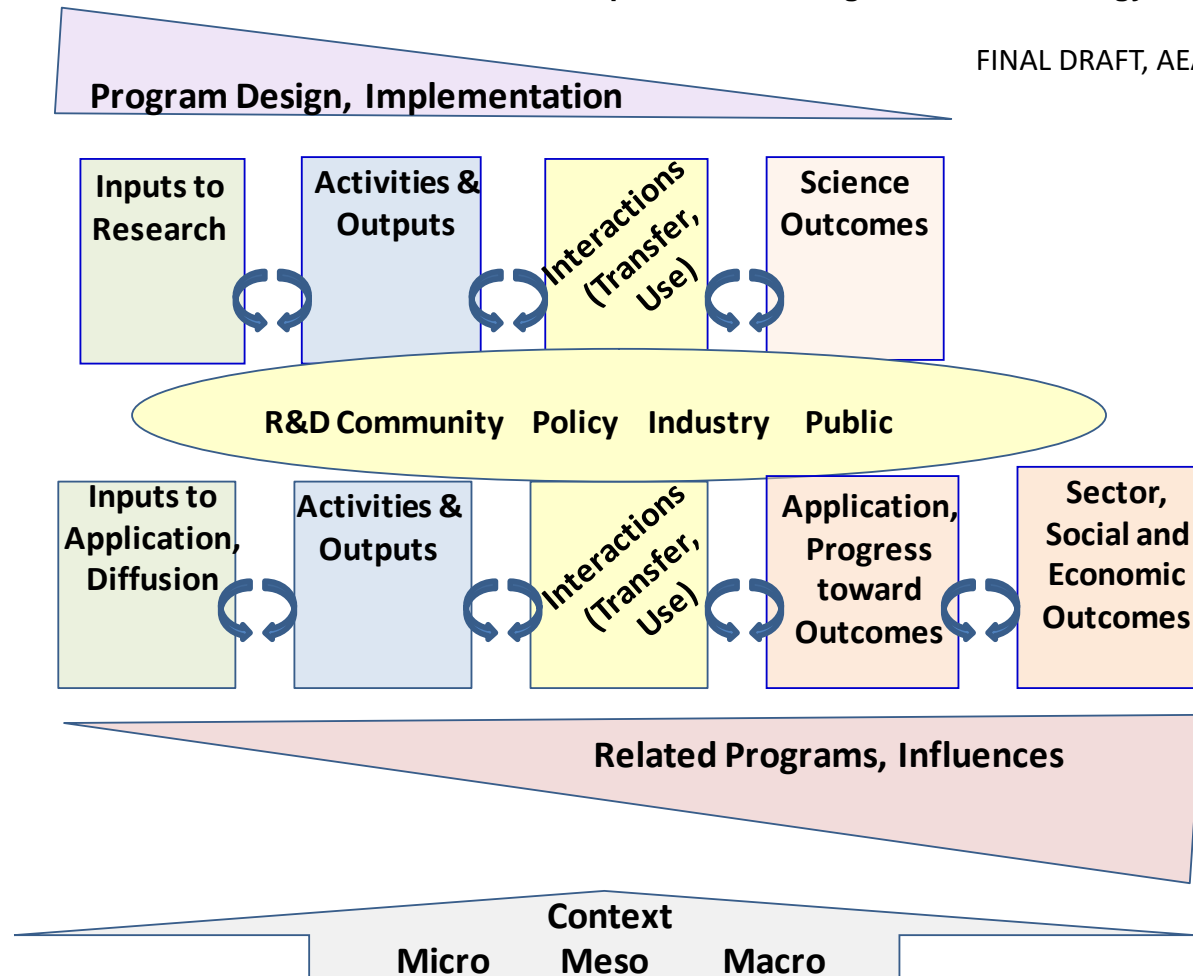
By the Research, Technology and Development Topical Interest Group of
the American Evaluation Association (AEA)

- The purpose of this paper is engage RTD evaluators, program managers, and policy makers in a dialogue about a current RTD evaluation practice and how it might be improved.
- The end goal is consensus on a common RTD evaluation language and practice that is then broadly implemented.
- This is needed because the diversity in RTD programs leads to evaluation without enough consideration of context.

A Proposed Generic Logic Model and Context To Outline the Diversity in RTD Programs

<http://comm.eval.org/researchtechnologyanddevelopmenteval/home/>

FINAL DRAFT, AEA RTD group October 2014



This results in a menu of contextual indicators and the many outcomes of RTD.

Possible Discussion Questions

- What has been your experience with evolving systems approaches to evaluating RTD and innovation?
- In my talk today, what did you agree with ? disagree with?

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