

A Logical Framework for Evaluating the Outcomes of Team Science

Presentation to
Committee on the Science of Team Science
National Research Council
October 24, 2013

Gretchen B Jordan



360 Innovation LLC

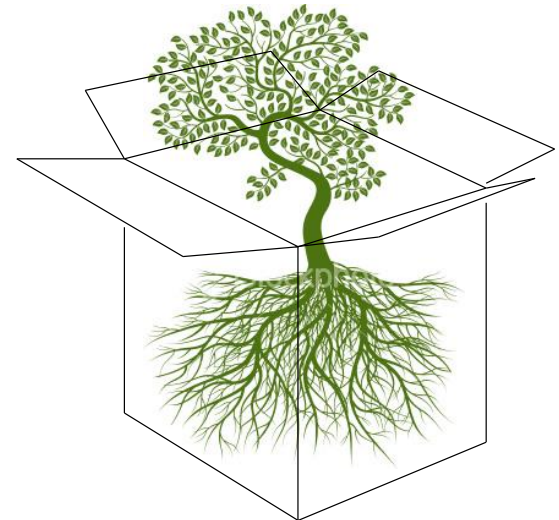
Outline

- Objectives
- Tool – logical framework
- Research Profiles
- Evaluation questions and timing
- Categories of indicators
- Differences by profile
- Summary - conclusions

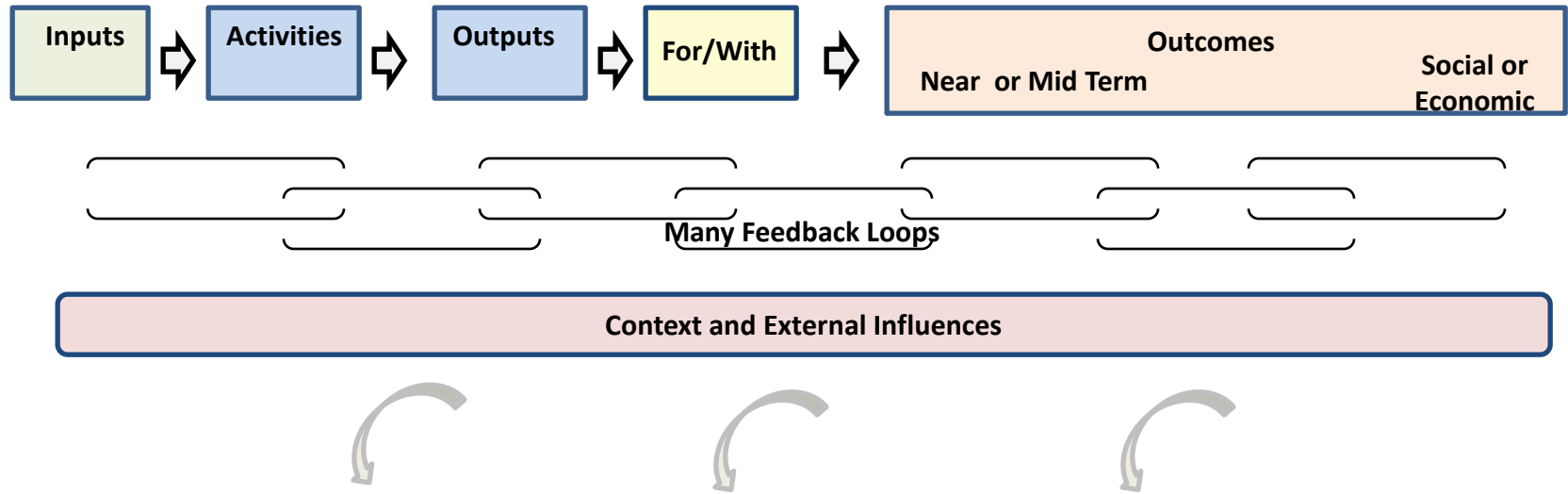
Objective

Provide ideas on evaluating outcomes of team science

- scientific and societal,
- for different profiles of teams and contexts,
- in order to assess “effectiveness” of teams,
- and see patterns to build theory.

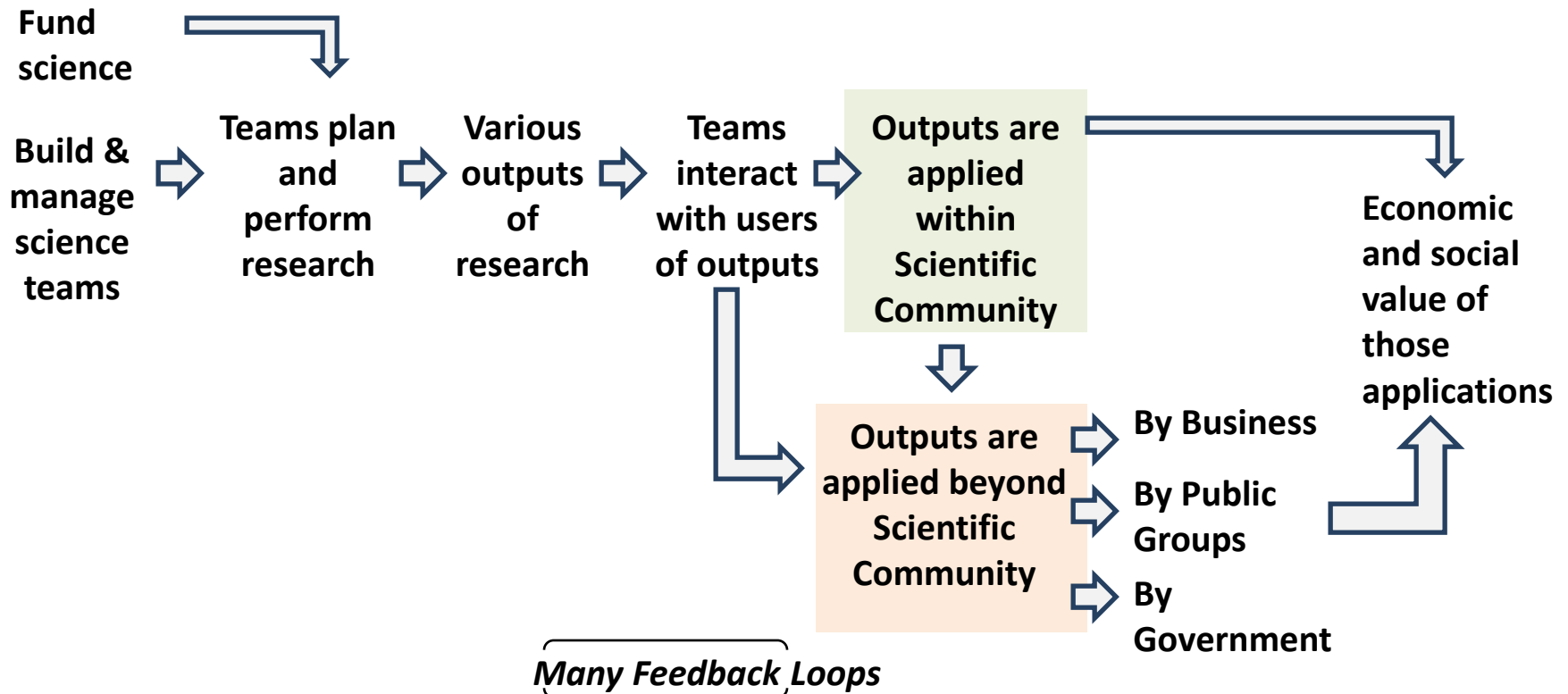


First, Develop A Logical Framework



Indicators for						
Inputs	Activities	Outputs	Interactions	Near term Outcomes	Mid term Outcomes	Social or Economic Outcomes
Characteristics of likely differentiating factors; External influences on achievement						

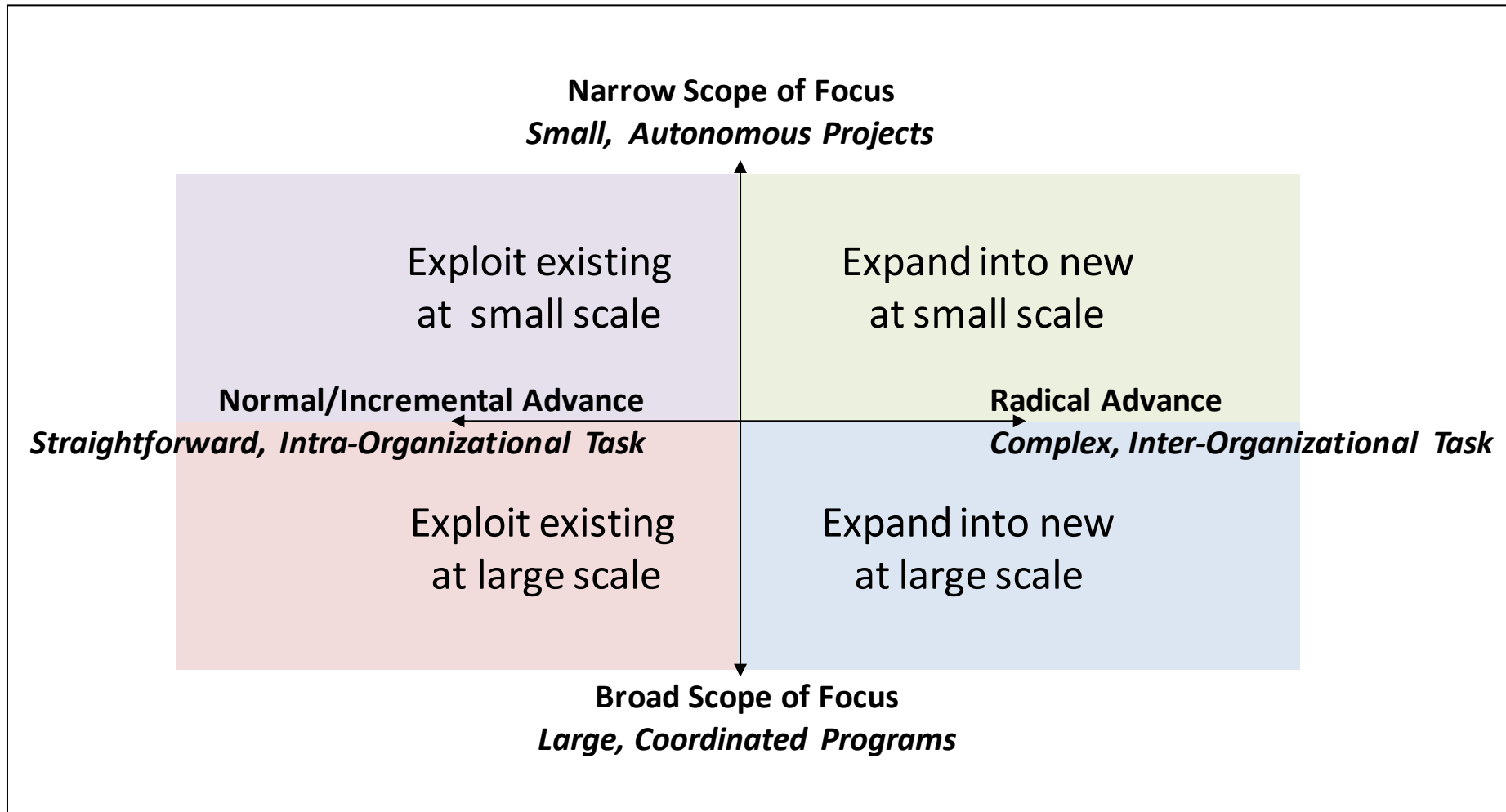
High Level Logic Model for Outcomes of Team Science



Characterization and External Influences



Outcomes Differ Depending on Research Profile



See Jordan, Hage and Mote, 2012, 2008, 2007, 2003

Timing of Evaluation of Outcomes, Effectiveness

Shorter Term (every 3-5 years)

- quantity, quality of outputs
- connectedness of team with potential users
- science outcomes ? (sometimes) application outcomes

Context

- Is there correlation between contextual/team characteristics and outputs/outcomes?
- What worked and what did not?
- How do outputs/outcomes compare to similar individual efforts?

Retrospective (after 10 years or more)

- Assess outcomes and their value
- Trace to/from teams; Plausible story of contribution

Logical Framework of Indicator Categories - 1

Inputs

- Funds
- Team quality, organization
- Instruments
- Knowledge base
- Technical base
- Research environment

[Resources]

Activities/Outputs

ACTIVITIES

- Plan
- Investigate
- Prove concept
- Prototype

OUTPUTS

- Ideas/
Knowledge advances
(Excellence, Novelty, Publications, tech reports)
- New research tools, techniques
- People trained
- Preparation for transition to application

[Productivity]

Interactions

CONNECTEDNESS

- With other scientists (pre-development)
- Across functions with developers, manufacturers, marketing
- Inter-sectoral
- With intermediaries
- With potential application users

LEVEL OF INTEGRATION
(co-located, boundary spanners, etc.)

[Indicates influence]

Logical Framework of Indicator Categories - 2

Near Term	Outcomes Mid Term	Long term
-----------	----------------------	-----------

SCIENCE OUTCOMES

1. Research activity “performance”
2. Research agility
3. Organization, integration of knowledge
4. Impact on science
5. Science infrastructure
 - Knowledge Base
 - Tools, Facilities
 - People

VALUE OF THOSE APPLICATIONS:

Economic

- general
- business
- energy

Social

- health
- environment
- security
- other

APPLICATION OUTCOMES (potential and actual):

1. Industry
2. Government
3. Tech. Infrastructure

ADOPTION INFRASTRUCTRE (potential and actual):

1. Business
2. Government procurement
3. Public groups

Logical Framework of Indicator Categories - 3

Macro

Context

- Availability of Capital
- Availability of Capabilities
- Ease of coordination

Meso/Sector

Characteristics of Interactions:
a. diversity
b. continuity
c. mechanism used

Nature of the application of research:
a. Breadth
b. Timing
c. Radicalness of change for application
d. Sector speed for technical change
e. Sector absorptive capacity, resources

Characteristics of the team (size, diversity, organizational/management, readiness, etc.)

Nature of the research problem
a. research type
b. radicalness
c. scope

Micro

Outcomes Vary By Research Profile

Narrow Scope

Exploit Existing at small scale

Expand into new at small scale

- 3- Coordinated activities/Revised textbooks
- 4- Incrementally new idea or prototype
- 5- Facilitated workshops, colloquia
- 6- Ideas seeded, awareness fostered

- 3- Uncoordinated activities/Emerging fields
- 4- Radically new idea or prototype
- 5- An expanding portfolio, risk
- 6- International thought leadership

Evolutionary

Applications Now

Applications in Future

Revolutionary

- 3- Correct diagnosis of the challenge
- 4- Incrementally improved product/process
- 5- Access to, utilization of facilities
- 6- New standards for quality, reduced harm

- 3- Rapidly deploying activities; strategic coalitions
- 4- Radically new product or process
- 5- Converge on theory/ aimed at technical need
- 6- Influenced public/private sector R&D/outputs

Exploit Existing at large scale

Expand into new at large scale

Broad Scope; Broader Applications (usually)

- 3 - Structure/Organization of Knowledge
- 4 - Scientific Impact

- 5 - Science Infrastructure
- 6 - Application, Societal Impacts

Categories from Feller & Gamota, 2003

Summary - Conclusions

- Assessing effectiveness and building theory requires linking outcomes to characteristics of teams and organizations.
- A logical framework is helpful for this.
- Everything here is a candidate for further discussion.

*For more discussion or questions, contact me,
gretchen.jordan@comcast.net*

Logical Framework of Indicator Categories To Assess Effectiveness of Team Science

Inputs	Activities/ Outputs	Interactions	Outcomes		
			Near Term	Mid Term	Long term
<ul style="list-style-type: none"> -Funds -Staff/Team quality -Instruments -Knowledge base -Technical base -Research environment 	<p>A. ACTIVITIES</p> <ul style="list-style-type: none"> -plan -investigate -prove concept - prototype <p>B. OUTPUTS</p> <ol style="list-style-type: none"> 1. Ideas/ Knowledge advances (Excellence, Publications, tech reports, IP, awards) 2. New research tools, techniques 3. People trained 4. Preparation for transition to application <p>[Productivity]</p>	<p>C. CONNECTEDNESS</p> <ul style="list-style-type: none"> -With other scientists (pre-development) -Across functions with developers, manufacturers, marketing -Inter-sectoral -With intermediaries - With potential application users <p>D. Level of integration (co-located, boundary spanners, etc.)</p> <p>[Indicates influence]</p>	<p>E. SCIENCE OUTCOMES</p> <ol style="list-style-type: none"> 1. Research activity “performance” 2. Research Agility 3. Organization, integration of knowledge 4. Impact on science <p>-Change state of the art, emerging fields, ...</p> <ol style="list-style-type: none"> 5. Change in science infrastructure 5a. Knowledge Base 5b. Tools, Facilities 5c. People, talent <hr/> <p>F. APPLICATION OUTCOMES (potential and actual):</p> <ol style="list-style-type: none"> 1. Industry: new product, process, service 2. Government: policy, program 3. Tech. Infrastructure: standards, generic technology <p>G. ADOPTION INFRASTRUCTRE (potential and actual):</p> <ol style="list-style-type: none"> 1. Business: distribution channel, logistics, training, etc. 2. Government procurement 3. Public: new media campaign, Advocacy group <p>[Application, Absorptive capacity]</p>	<p>H. VALUE OF THOSE APPLICATIONS:</p> <ul style="list-style-type: none"> Economic -general -business -energy Social -health -environment -security -other 	
Context					

<i>Micro</i>		<i>Meso/Sector</i>		<i>Macro</i>
Characteristics of the team (size, diversity, organizational/ management, readiness, etc.)	Nature of the research problem <ol style="list-style-type: none"> a. research type b. radicalness c. scope 	Characteristics of Interactions: <ol style="list-style-type: none"> a. diversity b. continuity c. mechanism used 	Nature of the application of research: <ol style="list-style-type: none"> a. Breadth b. Timing c. Radicalness of change for application d. Sector speed for technical change e. Sector absorptive capacity, resources 	Availability of: <ul style="list-style-type: none"> -Capital -Capabilities (people, instruments) -Ease of coordination