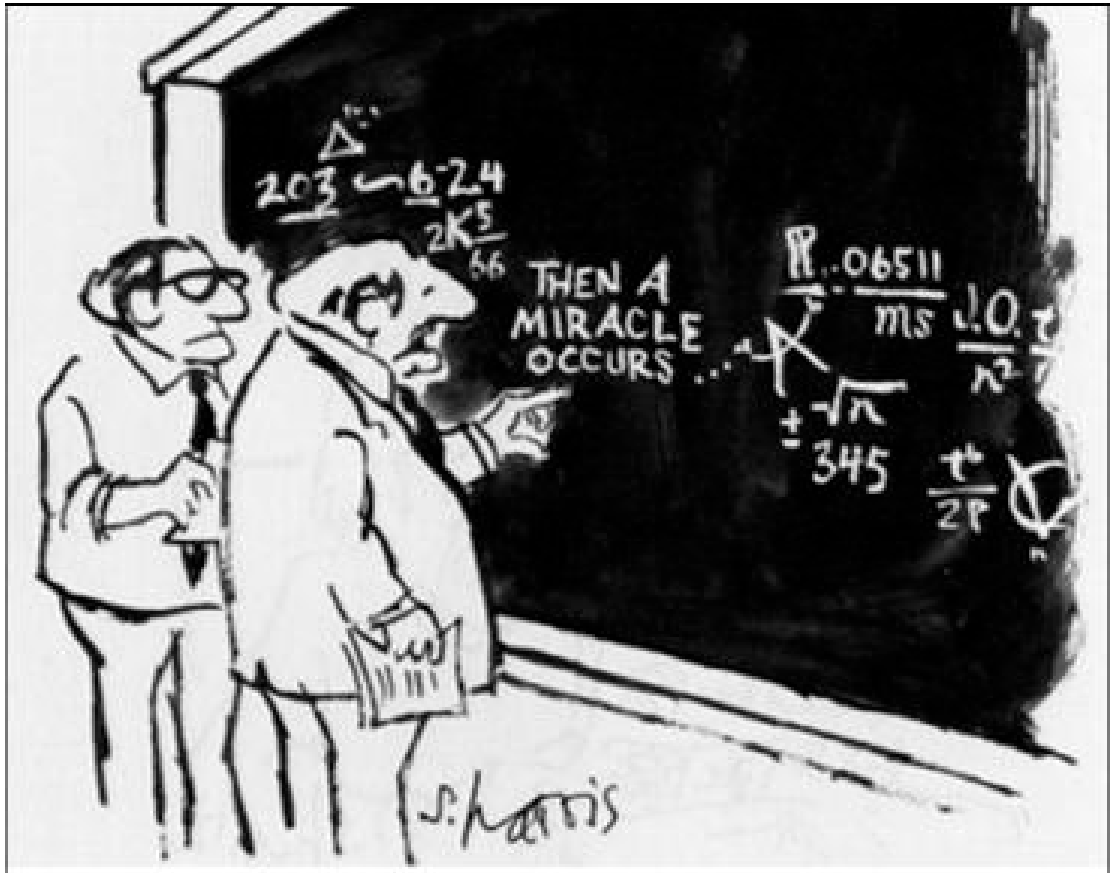
Examples of Basic Science Logic Models

- Moore Foundation MMI Program
- DOE Basic Science Program and Projects
- Portions of logic for large scale science infrastructure
- Logic of Outcomes of Team Science
- Organization funding virtual teams for basic science
- Where basic science fits in logic of innovation ecosystem

Developed by Gretchen B Jordan
360 Innovation LLC, formerly Sandia National Laboratories,
during work funded by Moore Foundation, U.S. DOE Office of Science, National Research Council of Canada, Canadian Institute for Advanced Research, and others.

Compiled June 13, 2018

Now for the harder part –the pathways from outputs to outcomes –magic in the middle



"I think you should be more explicit here in step two."

Logic Model for Marine Microbiology Initiative (MMI)

Revised May 15, 2017
G. Jordan with Science-Metrix

Inputs

MMI Activities
EQ 1, 5, 10, 11

- Design, select strategies, projects, and convene
- Fund individual researchers
- Fund multi-disciplinary research teams
- Fund supporting instrumentation, methods, data
- Fund experimental model systems

Process/Research Characteristics
EQ 4

Enablers:
Flexibility in funding, approach
Interactions of MM community
Higher risk research
Fill gaps, find synergies
Complementary, interdisciplinary projects
Use of multiple Techniques, new tools

Outputs
EQ 6.1

- Plans, grants, workshops
- Inter-institutional, international partnerships
- Innovative knowledge, frameworks
- Production/ sharing of methods, data sets, technologies
- New genetics tools

Outcomes 2012–2015, ongoing
EQ 6.2, 9

- Management adapts; Sum greater than parts
- New knowledge taken up by MM community
- New methods, tools, techniques, data sets developed, used
- New computational models developed, used
- Tests of exper-imental model systems

Outcomes (2015-2019)
EQ 6.3

- Researchers recognized, get follow on funds
- Exemplar lab and field studies provide insights, demonstrate new principles
- Synthesis, improved understanding, characterization, framework
- Use of genetics and experimental models broadens

Long-Term Outcome (2019 Goal)
EQ 6.4

- A new paradigm is established by uncovering novel principles about microbial interactions and flow of nutrients
- Unintended consequences

EQ 3, 4, 7

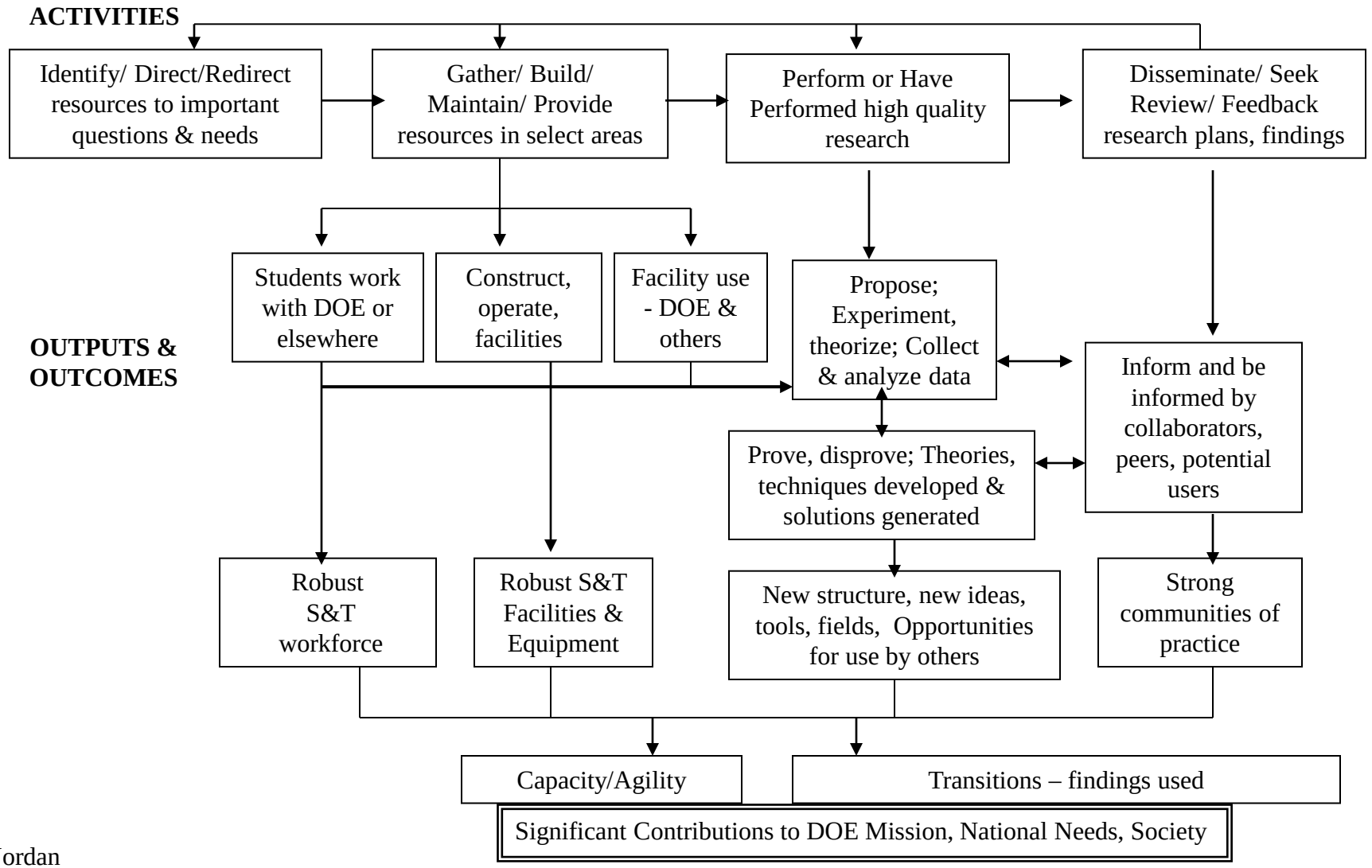
EQ 3, 4, 7

EQ 8

EQ 2, 7, 8

External Influences: Roles of other funders of the field; Knowledge base and progress made by competing and complementary scientific inquiry; Limited absorptive capacity for efforts to utilize research findings

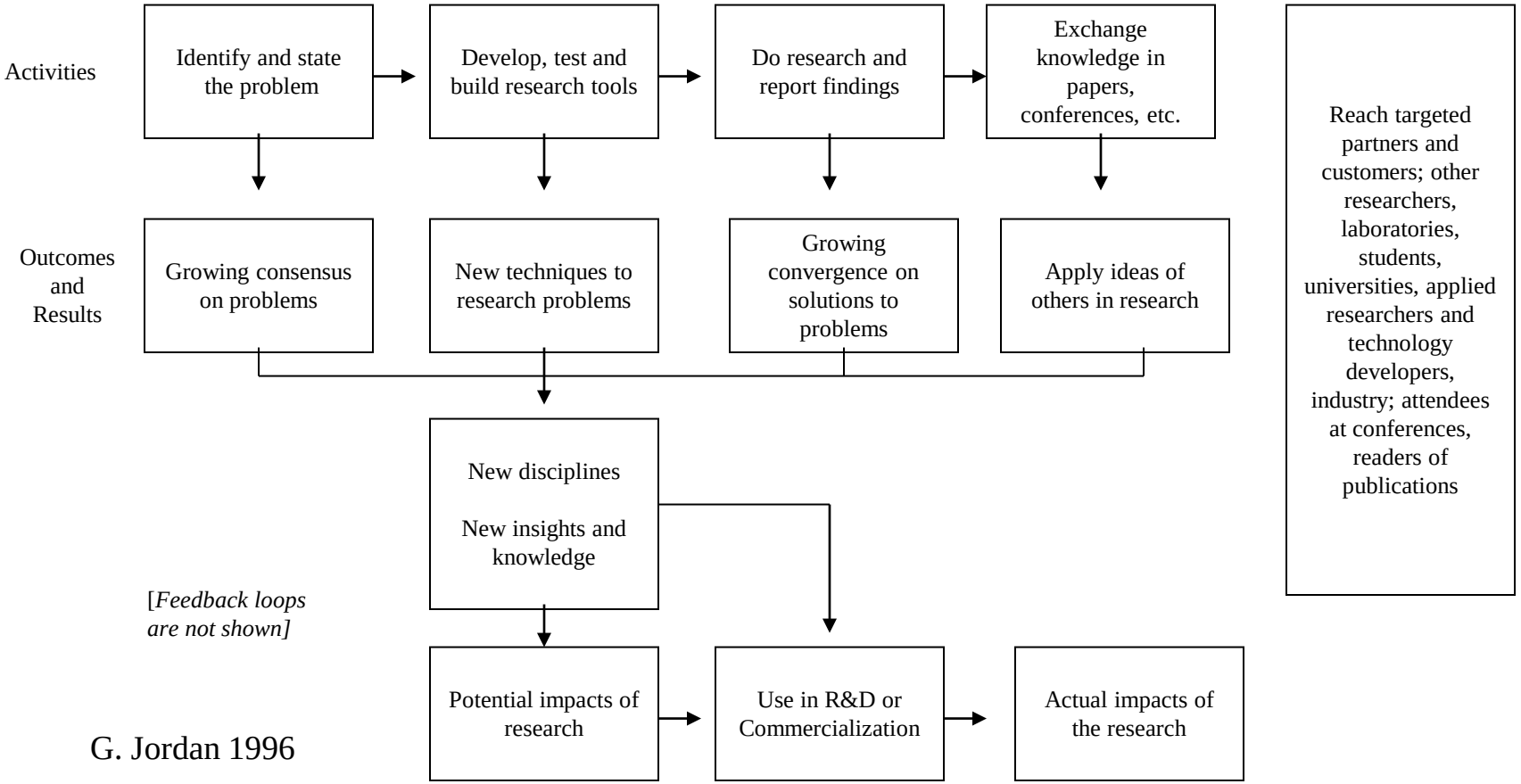
Logic Model of a Program of Basic Research (U.S. DOE DRAFT -Unofficial)



G. .Jordan
05/13/2002

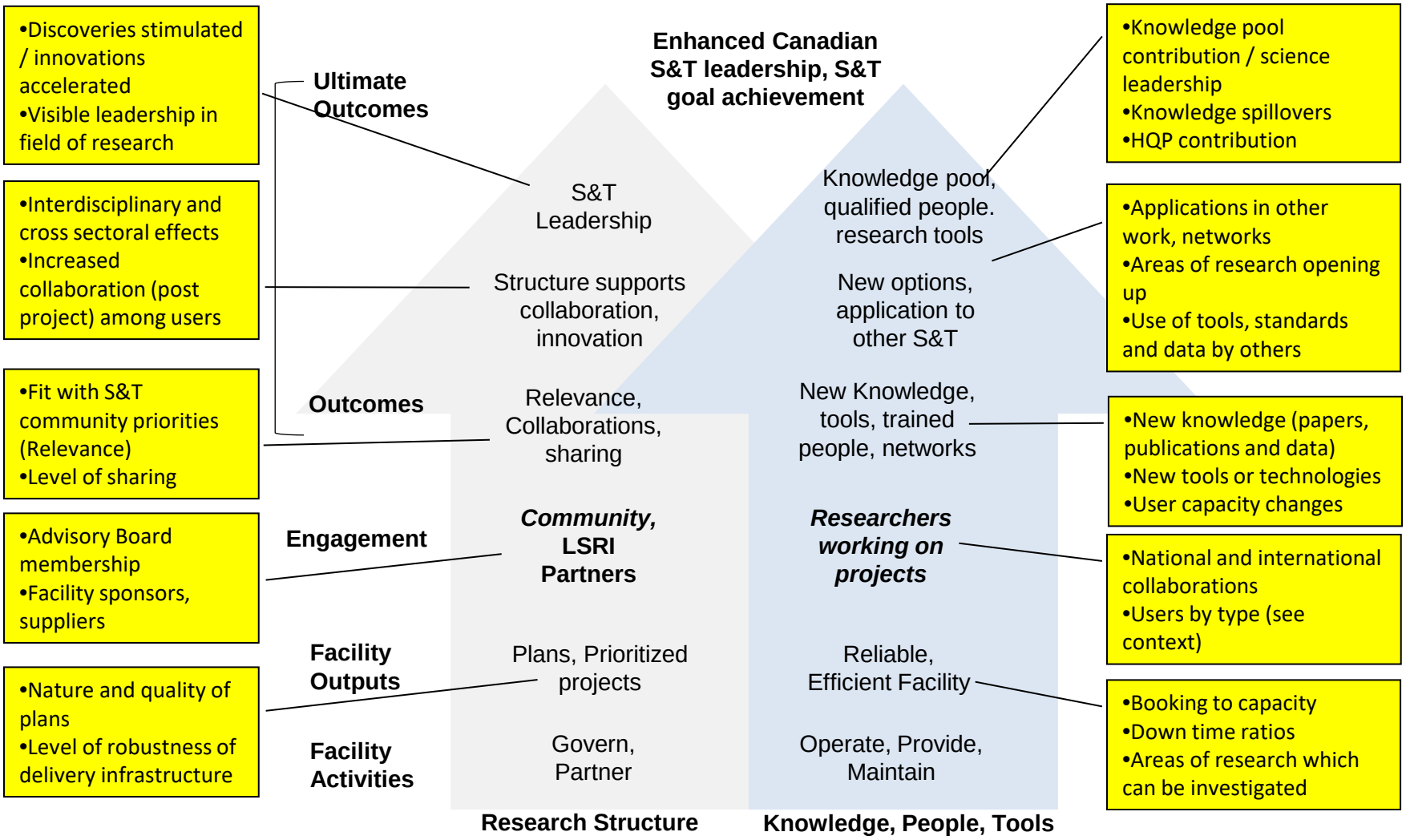
The Logic of a Basic Research Project

Manage Resources: expenditures by types of activities, skilled staff, core competencies; environment for quality research, soundness of research planning and evaluation, use scientific method



G. Jordan 1996

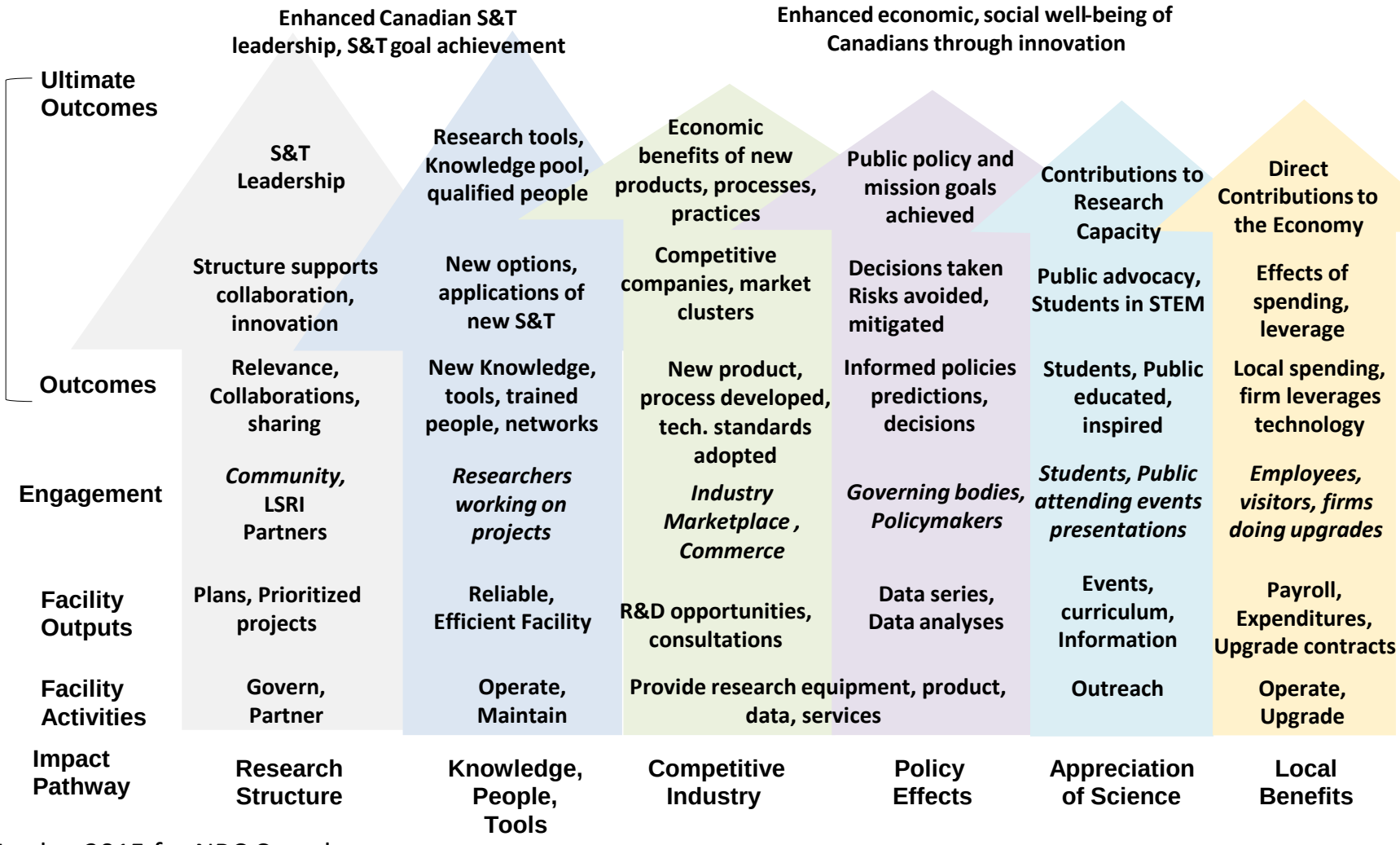
LSRI: Create a Research Structure That Supports Discovery and Innovation and Build Knowledge and Research Capacity – Some Select Metrics



G. Jordan 2015 for NRC Canada

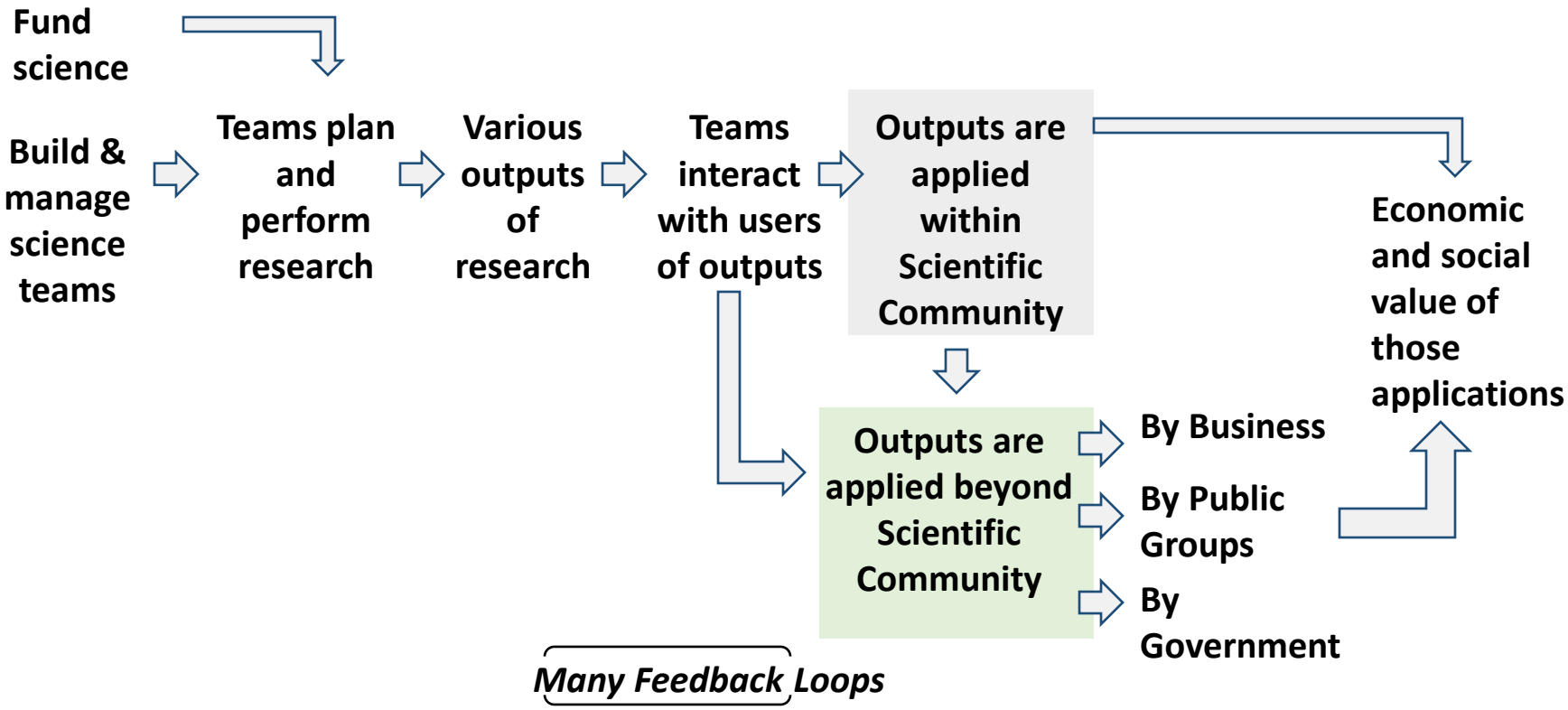
Qualitative contextualized approaches (e.g. case studies) will be important to complement quantitative indicators.

A Generic Logic Model Large Scale Science Infrastructure (LSRI) with Six Impact Pathways



G. Jordan 2015 for NRC Canada

High Level Logic Model for Outcomes of Team Science



Logical Framework of Indicator Categories To Assess Effectiveness of Team Science

Inputs

-Funds
-Staff/Team quality
-Instruments
-Knowledge base
-Technical base
-Research environment

Activities/ Outputs

A. ACTIVITIES
-plan
-investigate
-prove concept
- prototype

B. OUTPUTS
1. Ideas/ Knowledge advances (Excellence, Publications, tech reports, IP, awards)
2. New research tools, techniques
3. People trained
4. Preparation for transition to application

[Productivity]

Interactions

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

D. Level of integration (co-located, boundary spanners, etc.)

[Indicates influence]

Outcomes

Near Term

E. SCIENCE OUTCOMES
1. Research activity "performance"
2. Research Agility
3. Organization, integration of knowledge
4. Impact on science
-Change state of the art, emerging fields, …
5. Change in science infrastructure
5a. Knowledge Base
5b. Tools, Facilities
5c. People, talent

Mid Term

F. APPLICATION OUTCOMES (potential and actual):
1. Industry: new product, process, service
2. Government: policy, program
3. Tech. Infrastructure: standards, generic technology

G. ADOPTION INFRASTRUCTRE (potential and actual):
1. Business: distribution channel, logistics, training, etc.
2. Government procurement
3. Public: new media campaign, Advocacy group

[Application, Absorptive capacity]

Long term

H. VALUE OF THOSE APPLICATIONS:
Economic
-general
-business
-energy
Social
-health
-environment
-security
-other

Context

Micro

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

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

Meso/Sector

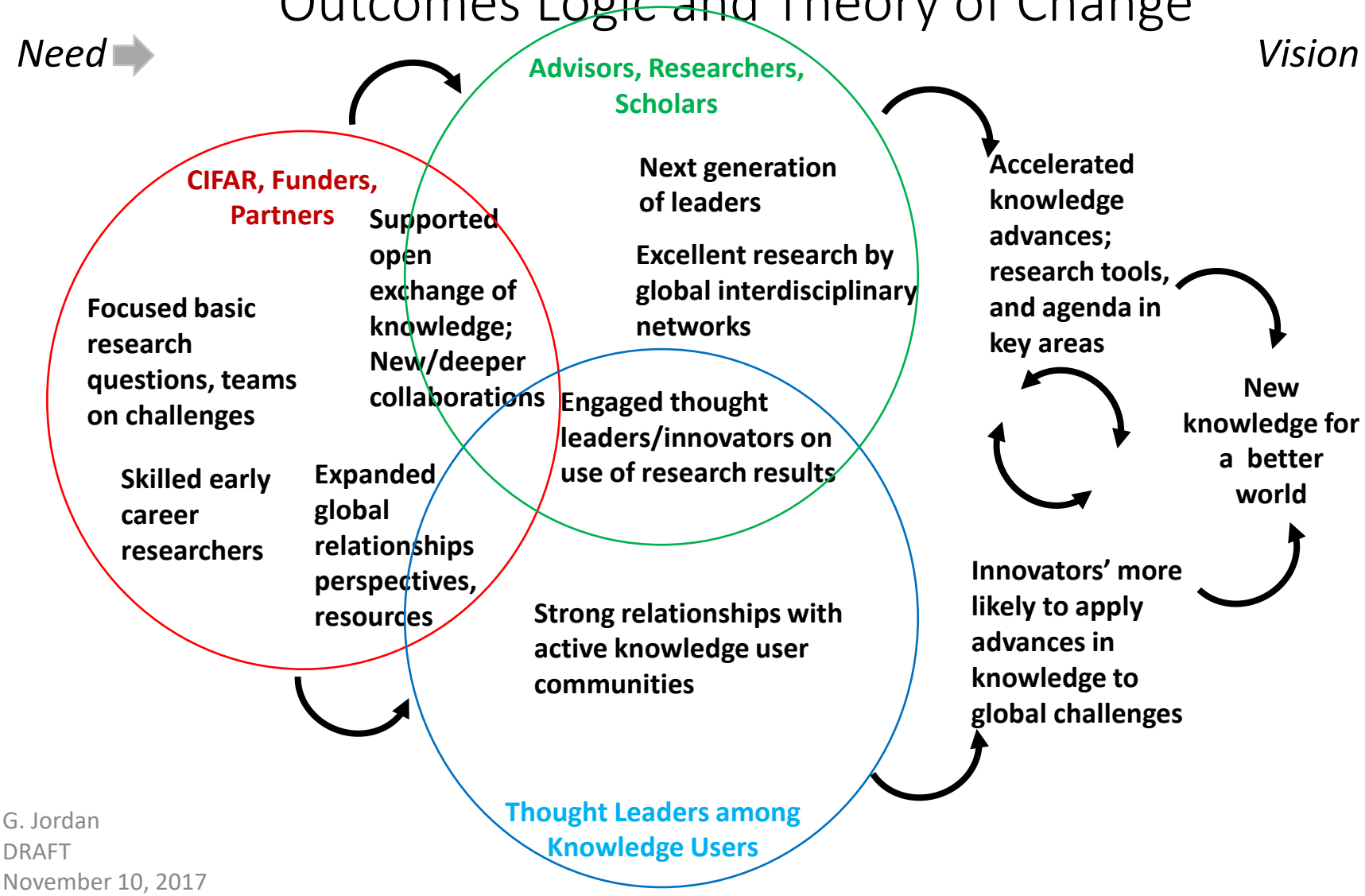
Characteristics of Interactions:
a. diversity
b. continuity
c. mechanism used

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

Macro

Availability of:
-Capital
-Capabilities (people, instruments)
-Ease of coordination

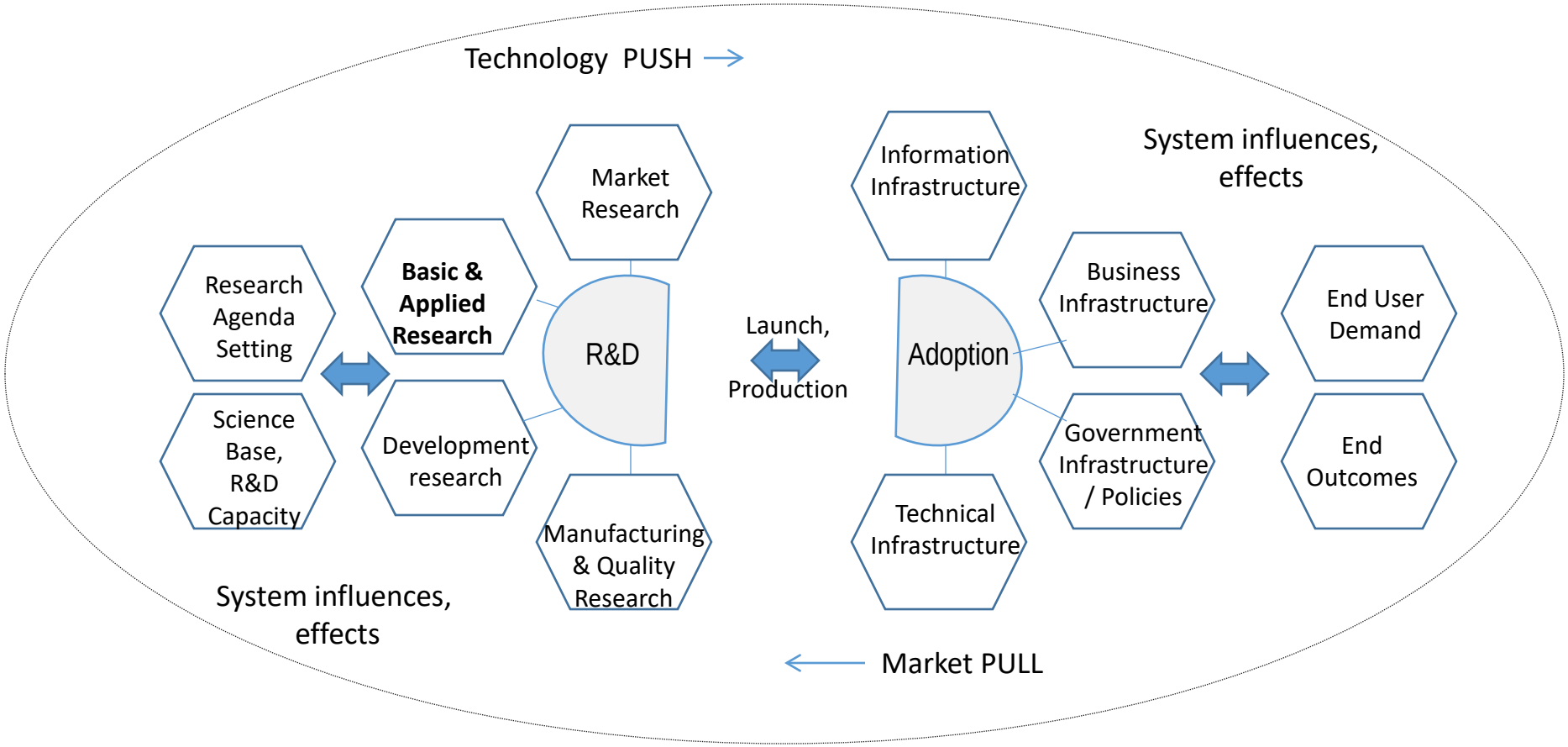
Canadian Institute for Advanced Research (CIFAR) Outcomes Logic and Theory of Change



G. Jordan
DRAFT
November 10, 2017

External Influences

A Systems Logic Model of the R&D to Adoption Life Cycle



Jordan, G. 2010. A Theory-Based Logic Model for Innovation Policy and Evaluation, Research Evaluation, 19(4), October 2010, 263-274.

G. Jordan, November 2011