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The Socio-Economic and Environmental Information Needs Knowledge Base (SEE-IN KB): A GEOSS Knowledge Base Linking Users to Knowledge

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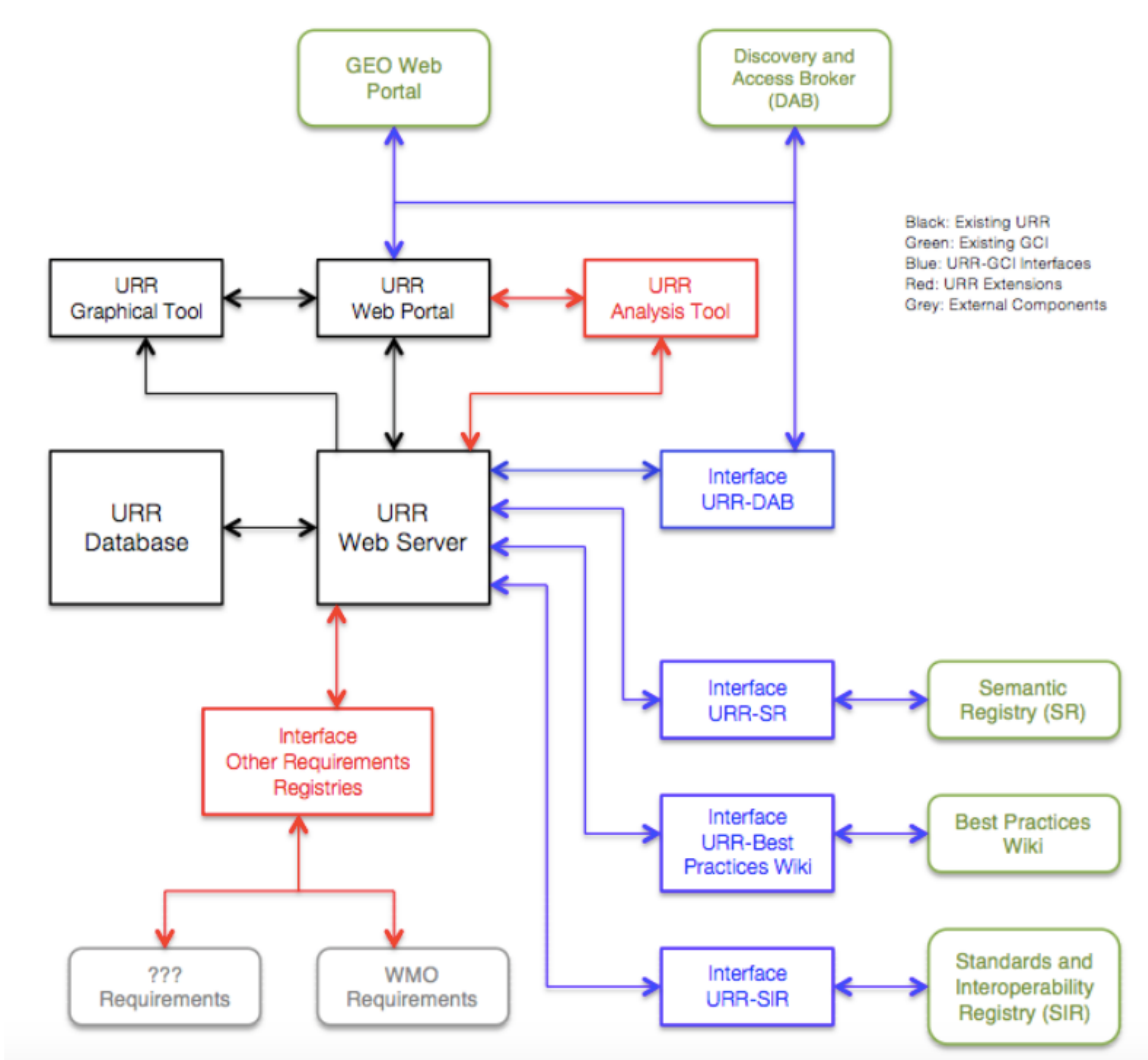
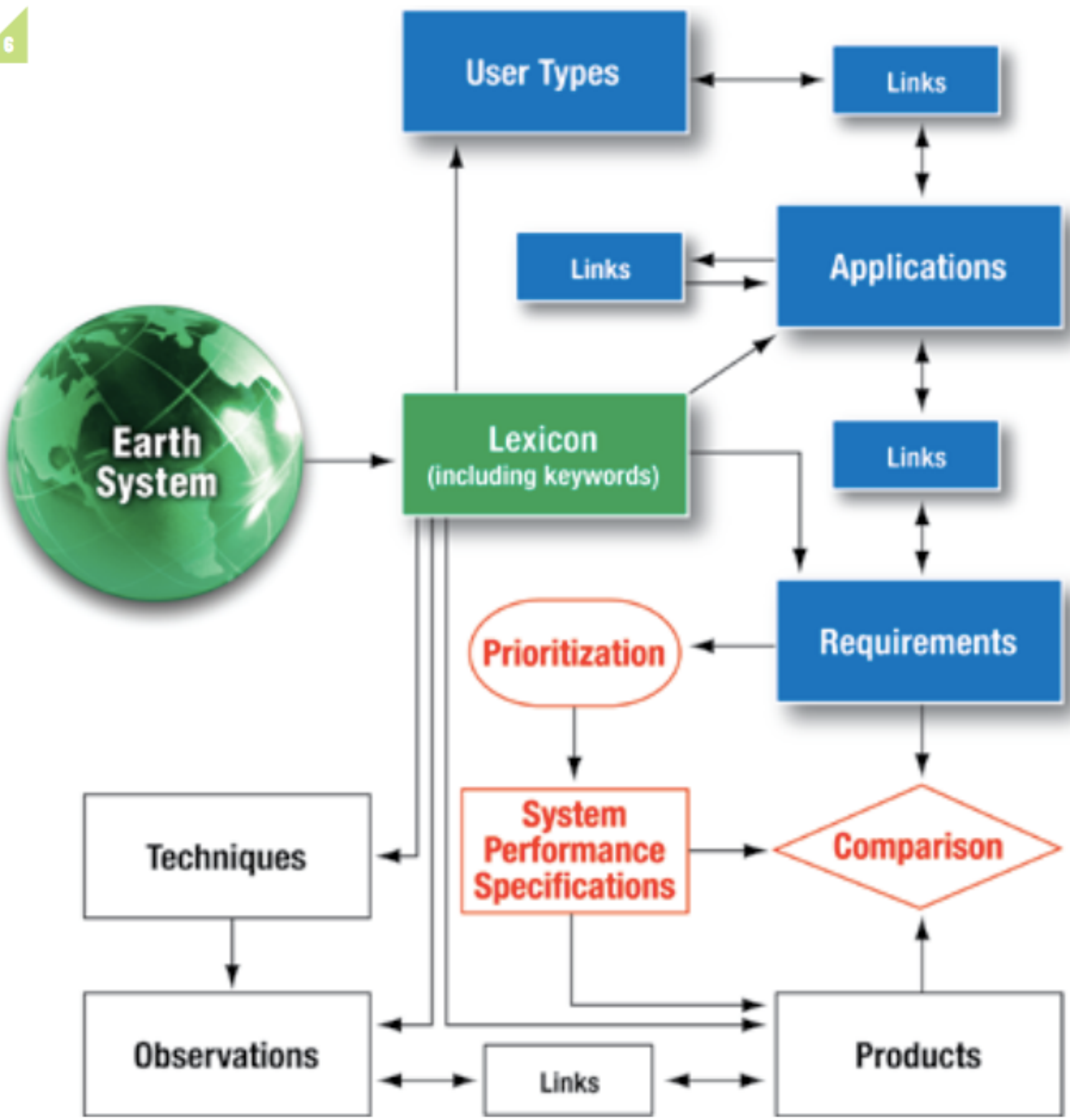
- Lessons Learned
- New Developments
- Challenges
- Knowledge Base Concept

ConnectinGEO

Funded by EC in Horizon 2020 grant agreement No. 641538

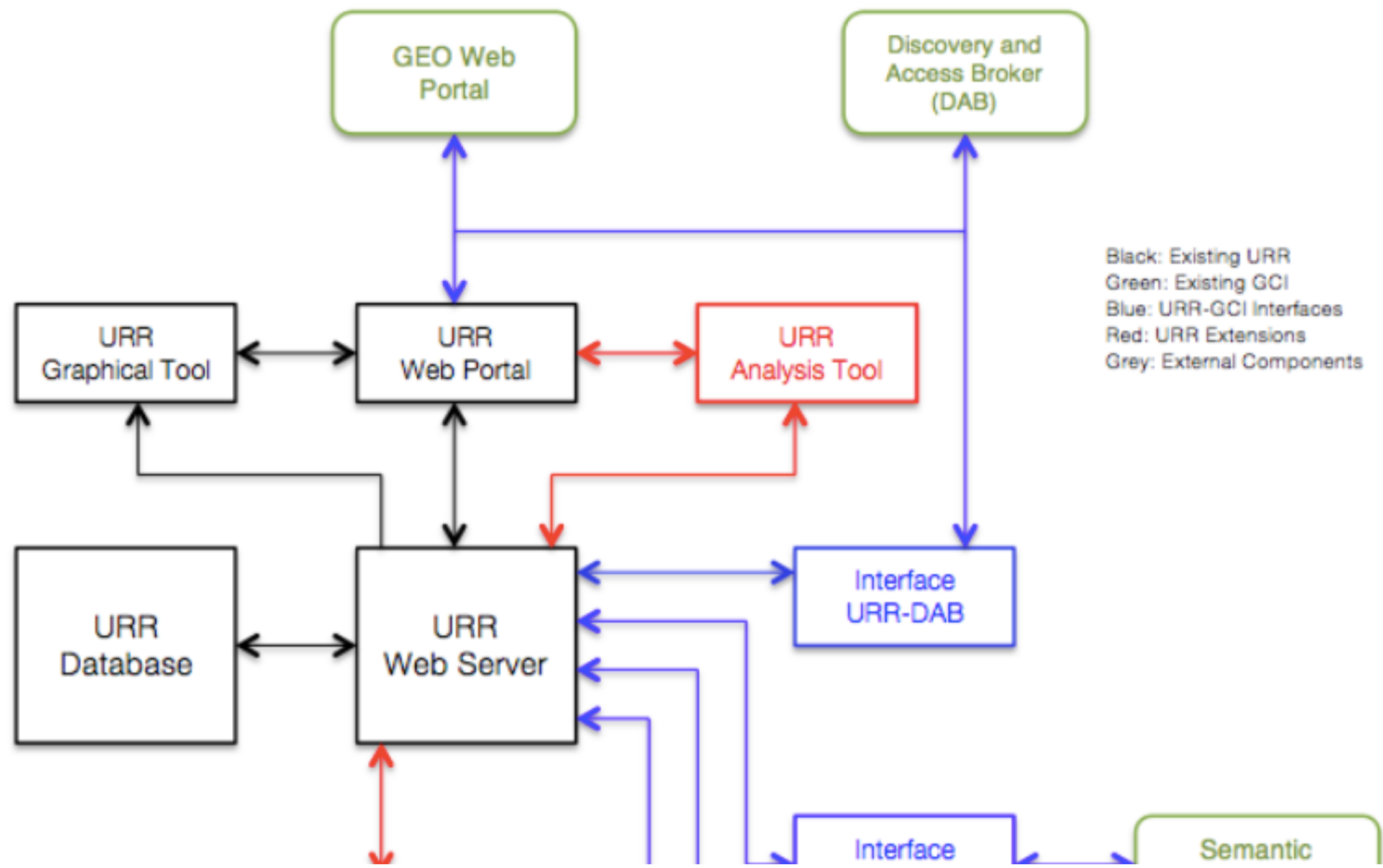
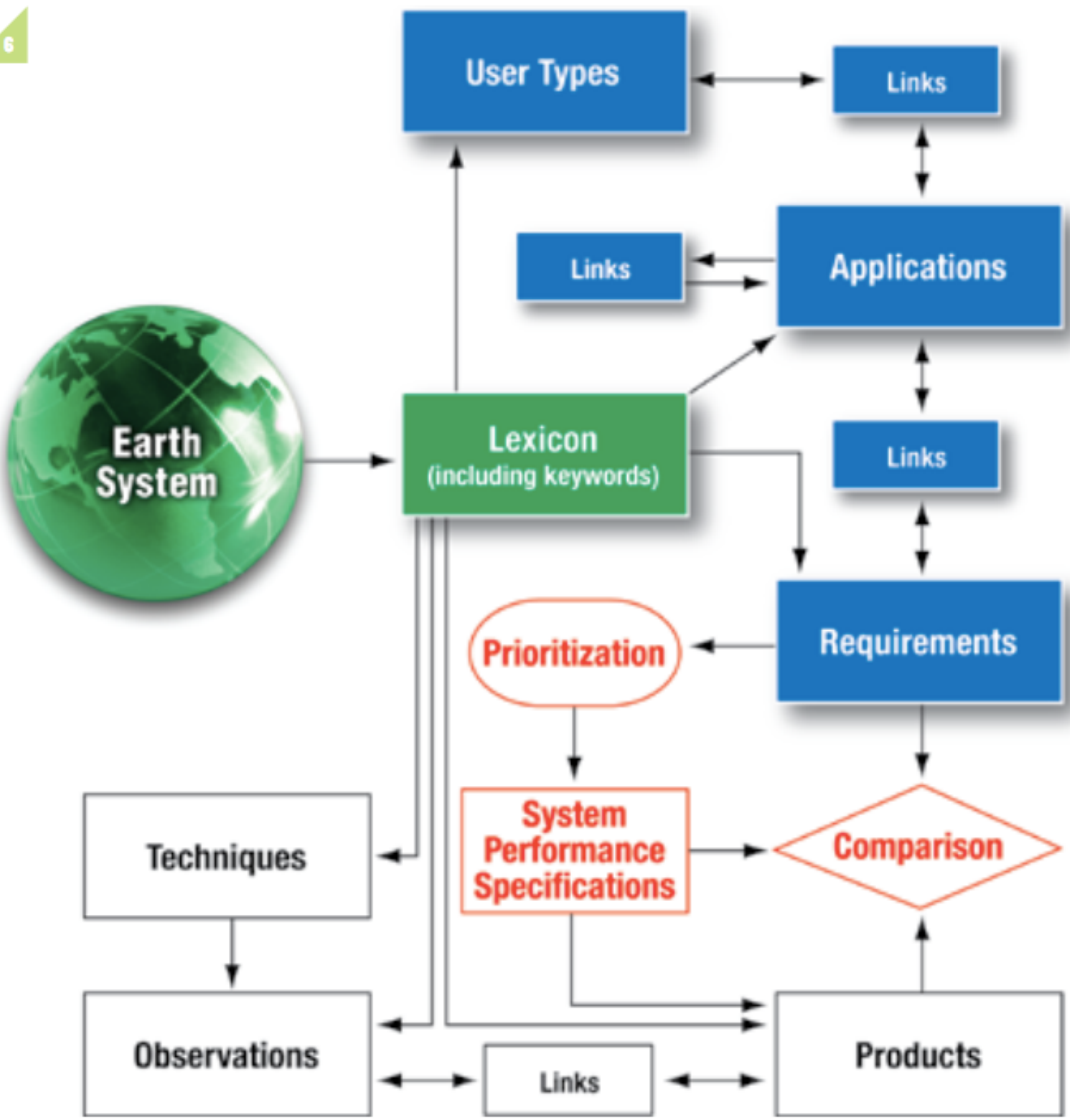
GEOSS User Requirements Registry (URR) 2006-2013

6



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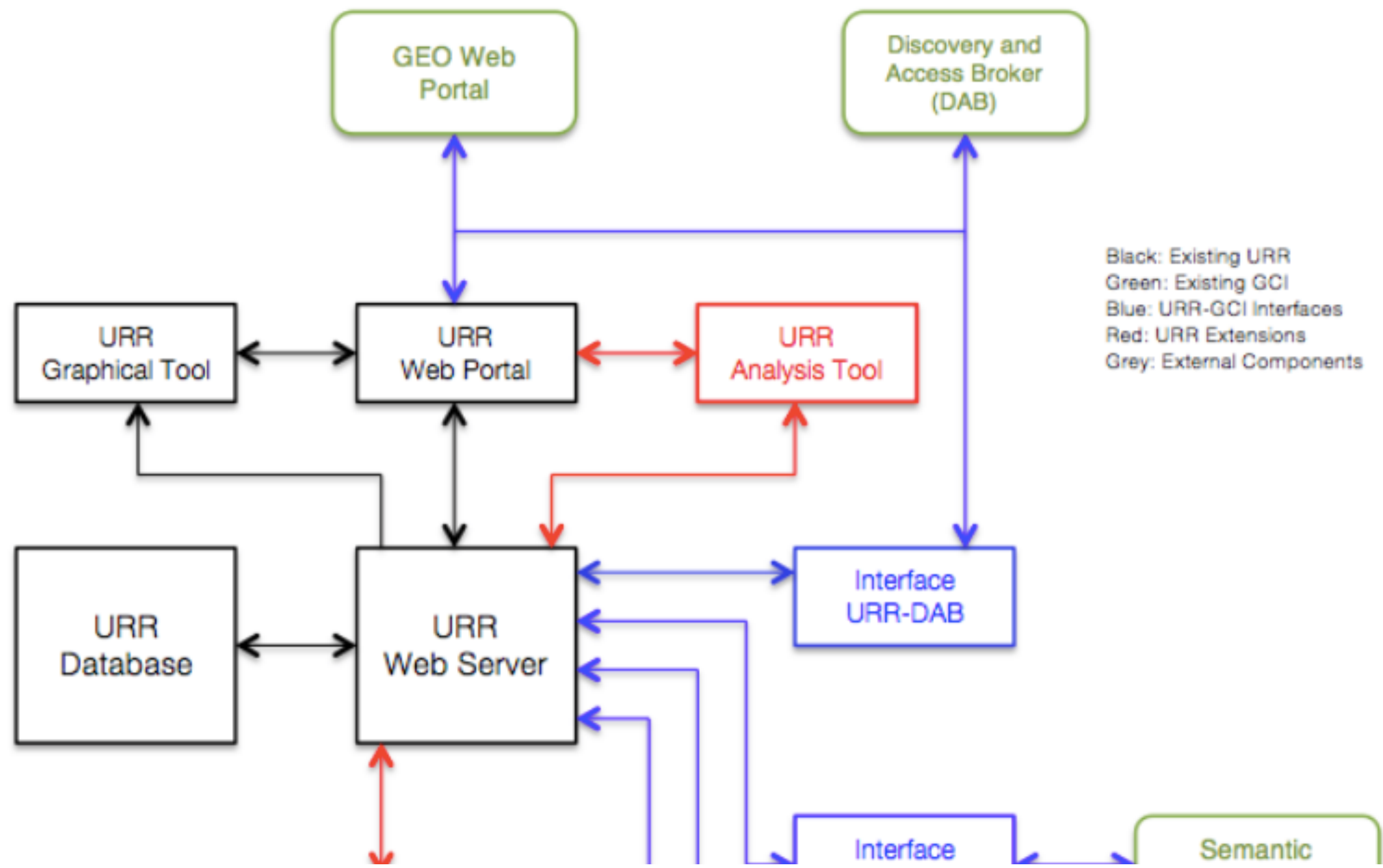
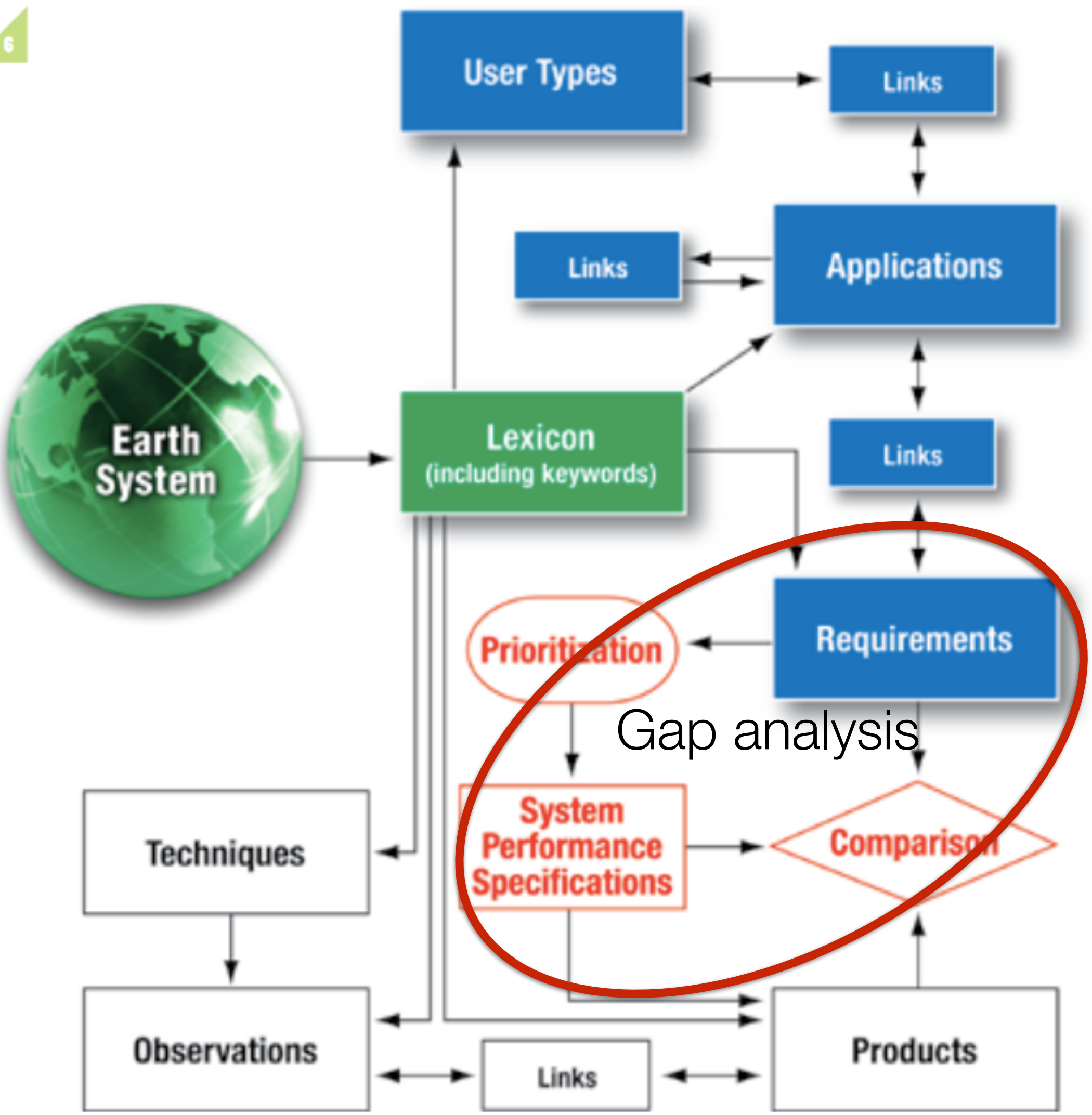
6



Questions:
 Who are the users?
 What are they doing?
 What do they need to do it?

GEOSS User Requirements Registry (URR) 2006-2013

6



Questions:
 Who are the users?
 What are they doing?
 What do they need to do it?

Motivation: Gap analysis and prioritization

FREEZE ALL

BACK

FORWARD

Search for:

SEARCH

History

hazard analysis, determination of pdf

APPLICATION Hide Show Names

hazard analysis, determination of pdf

hazard assessment

hazard detection

REQUIREMENT Hide Show Names

continental surface metfield, long-term

local sea level variations, long term

pollution sources

USERTYPE Hide Show Names

volcanologist

RESEARCH Hide Show Names

anomalous surface displacement

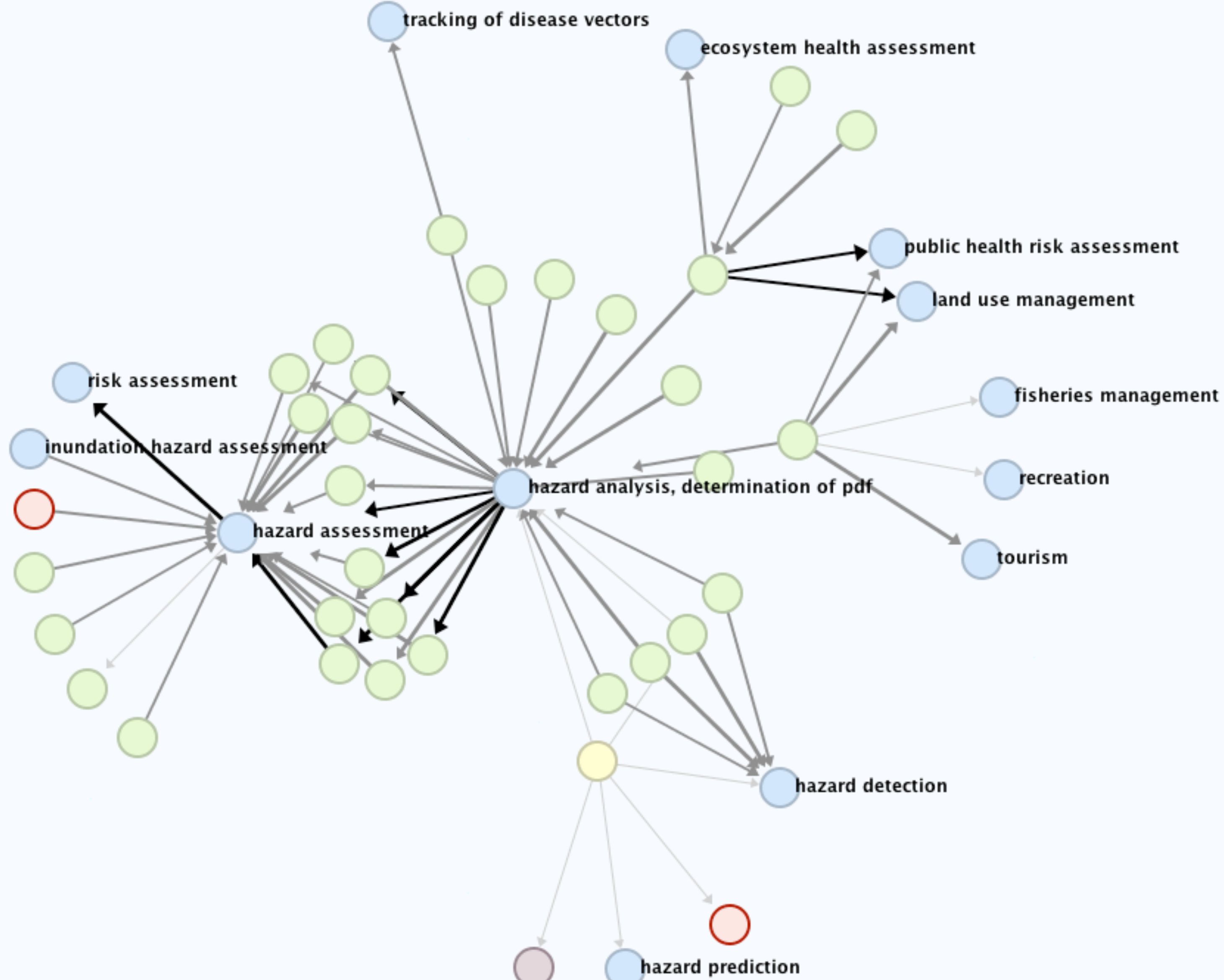
time-variable hazard probabilities

TECHNOLOGY Hide Show Names

INFRASTRUCTURE Hide Show Names

GNSS real-time network

CAPACITYBUILDING Hide Show Names

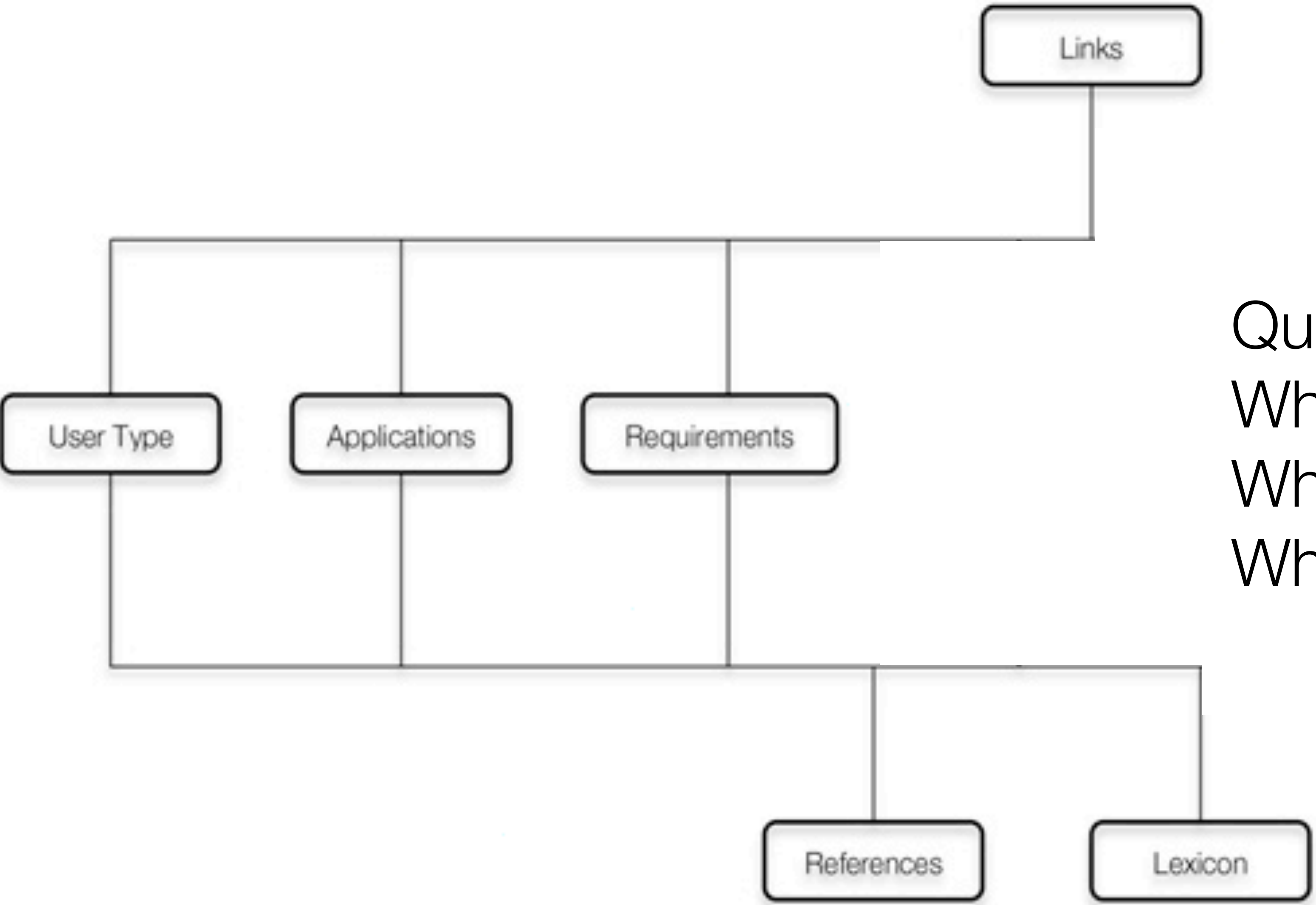


Scale : 1

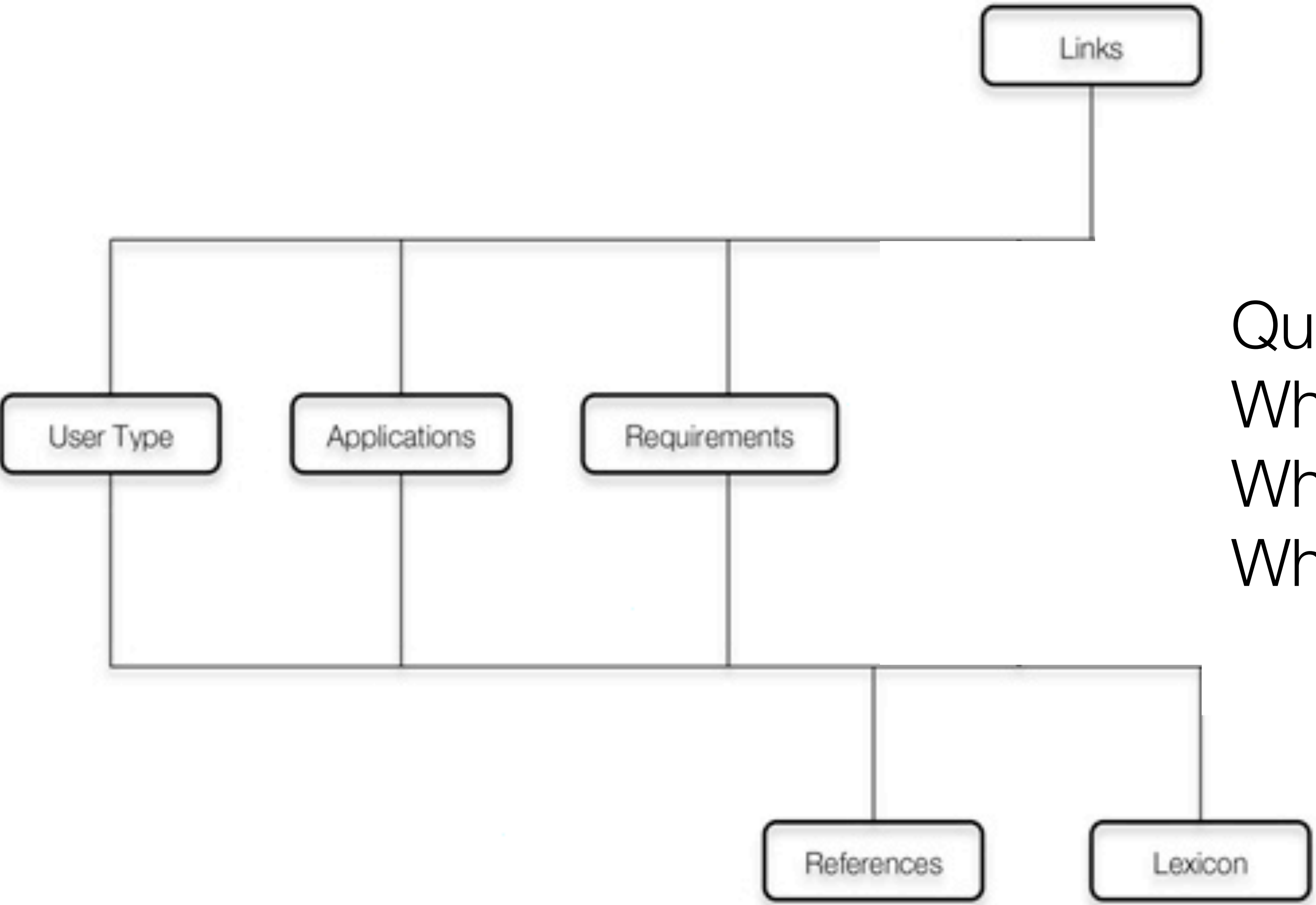
LEGEND:

● User Type
 ● Requirement
 ● Application
 ● Research
 ● Technology
 ● Infrastructure
 ● Capacity Building
 CRUCIAL Link (thick line)
 STRONG Link (medium line)
 WEAK Link (thin line)
 No Data (dashed line)

GEOSS User Requirements Registry (URR) 2006-2013



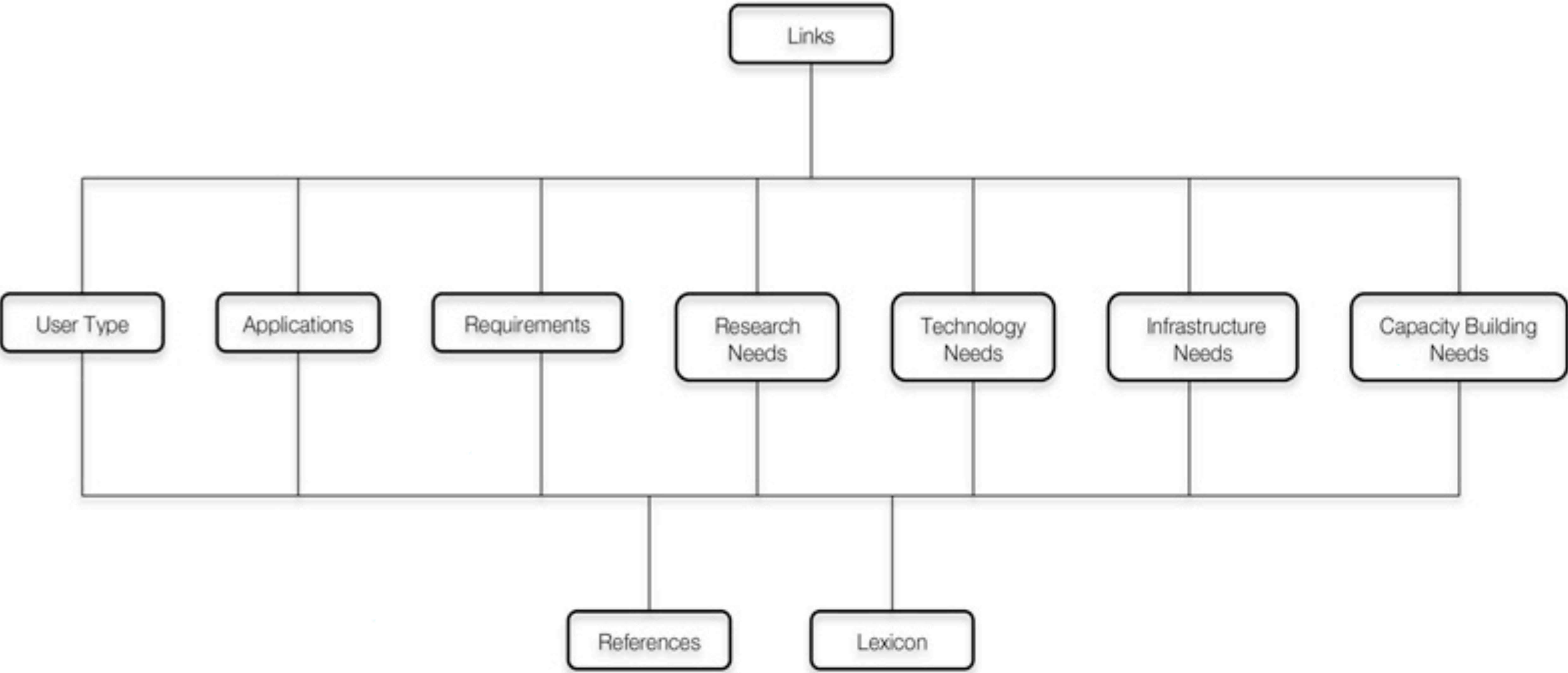
Questions:
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Who are the users?
What are they doing?
What do they need to do it?

Users required changes in relations (structure) and flexibility

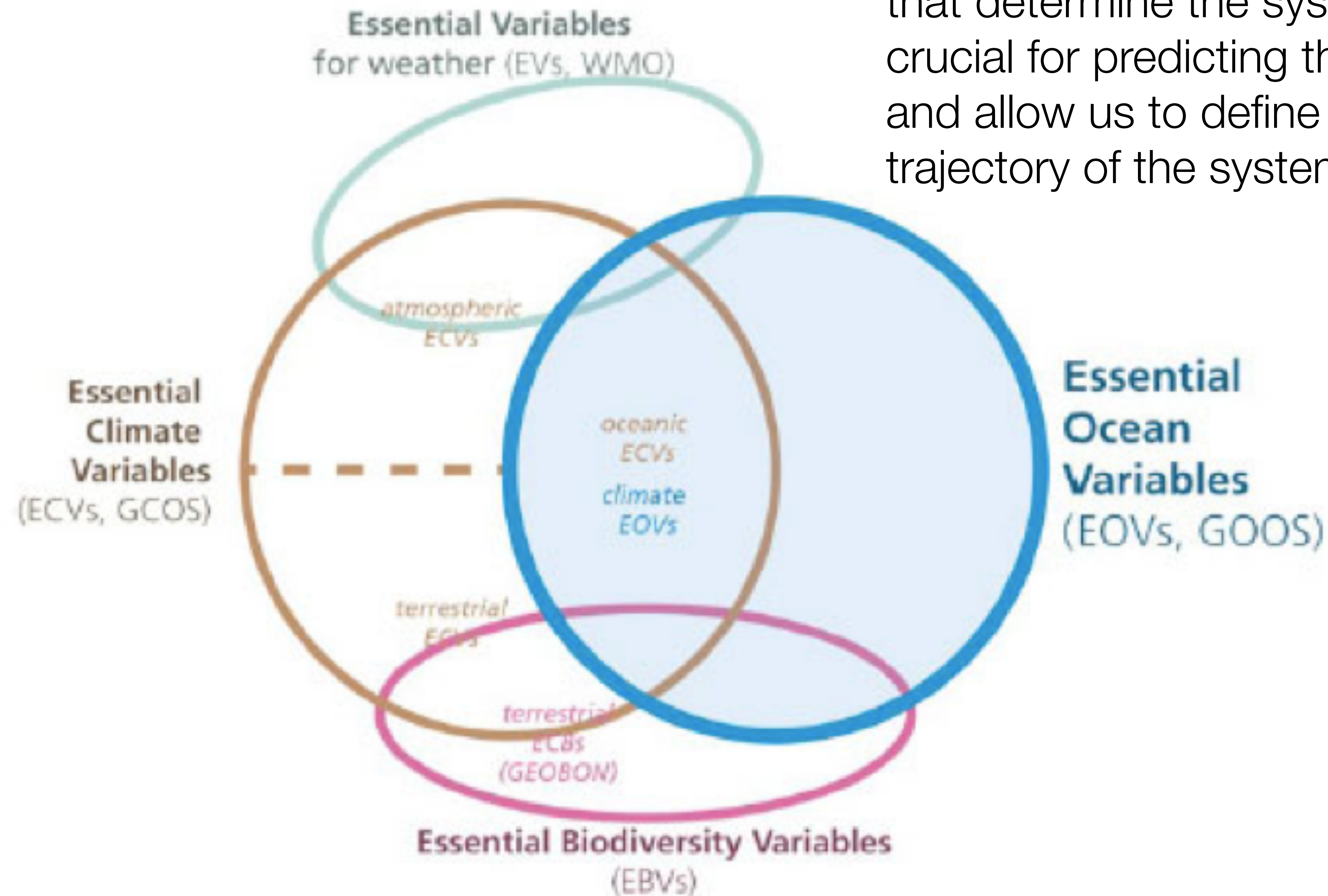
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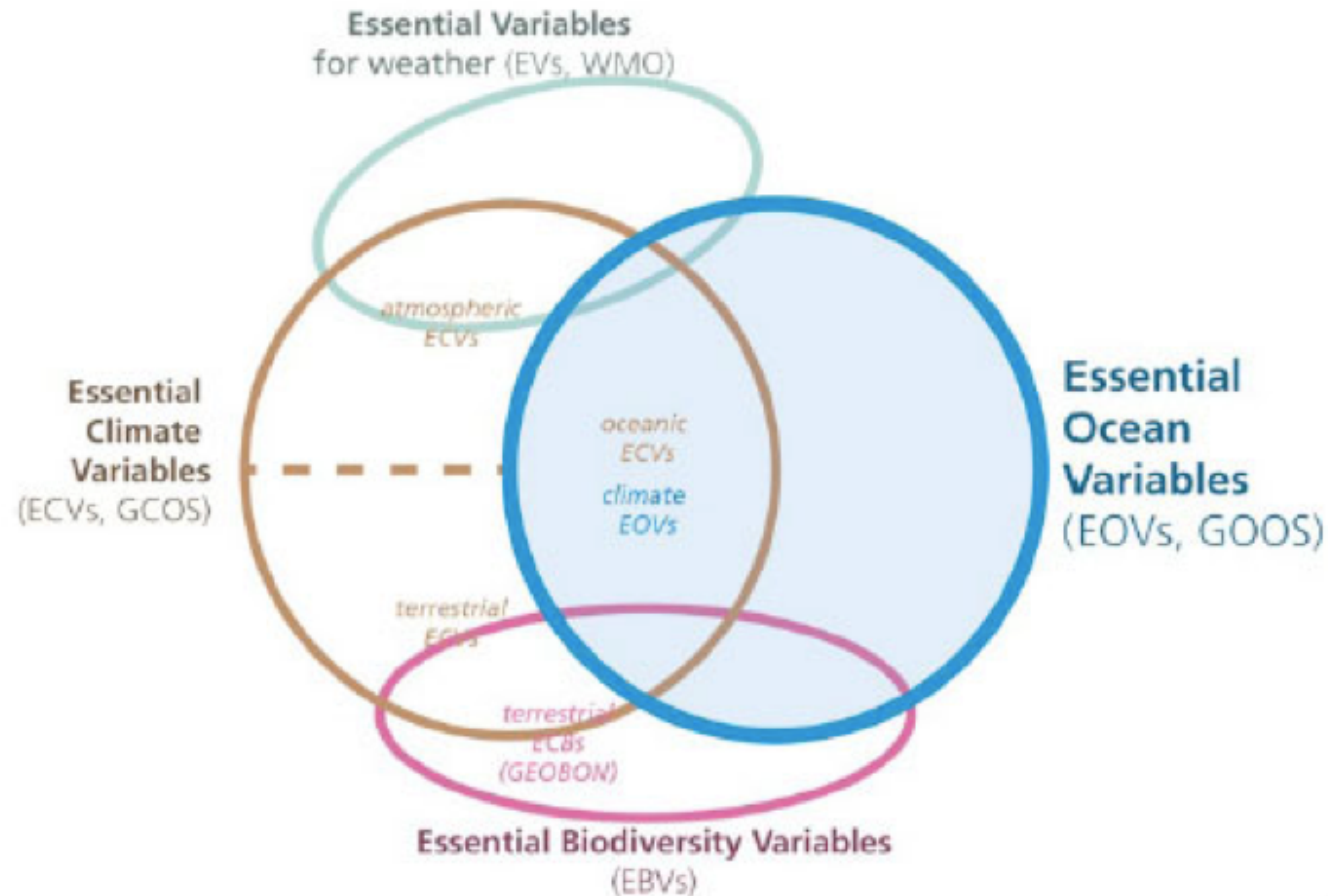
New Developments: Essential Variables

“Essential Variables are a minimal set of variables that determine the system’s state and evolution, are crucial for predicting the system developments, and allow us to define a metrics that measures the trajectory of the system.” *ConnectinGEO (2015)*



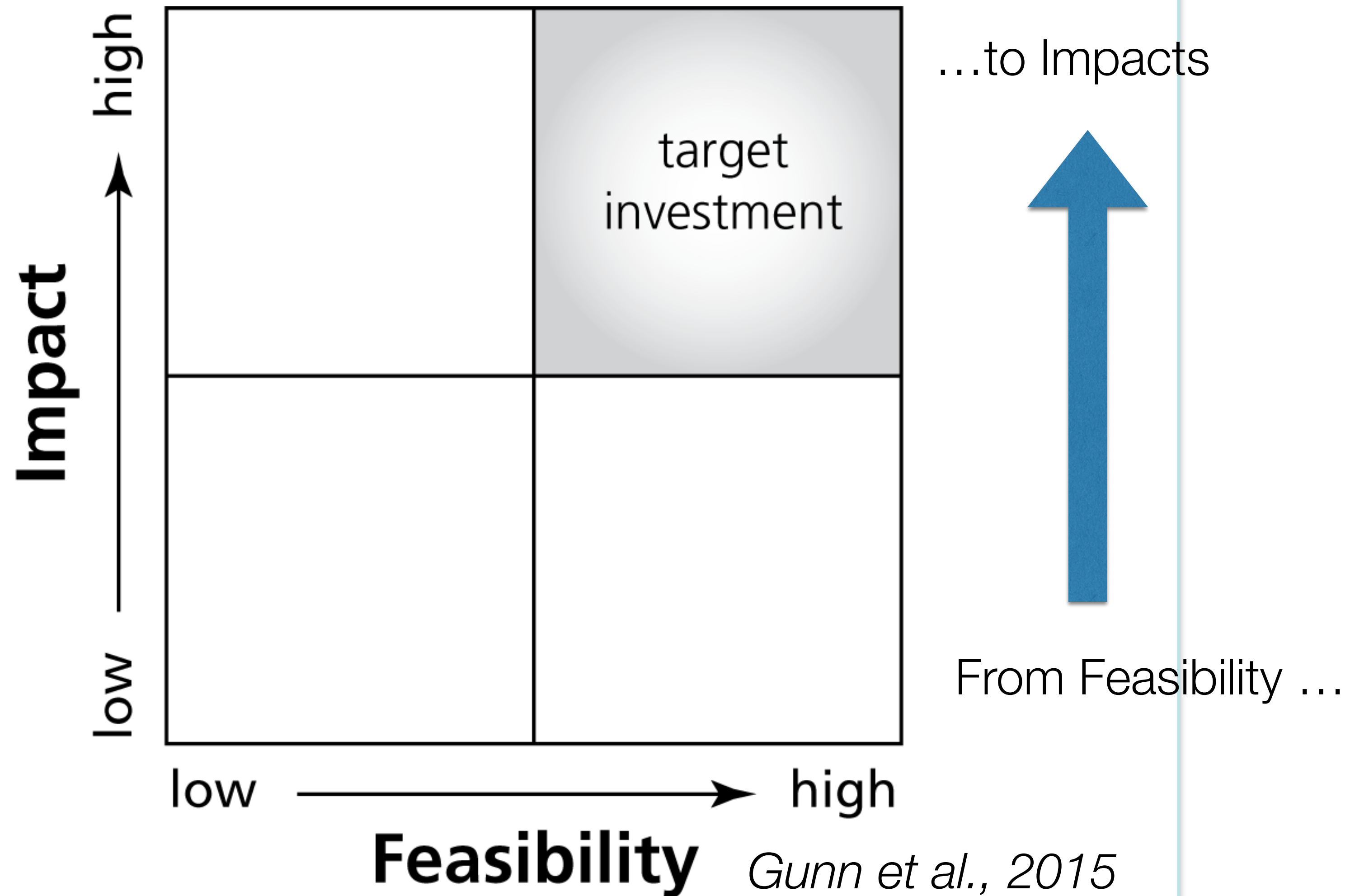
New Developments: Essential Variables

Most (GEO) approaches to EVs are expert and feasibility based



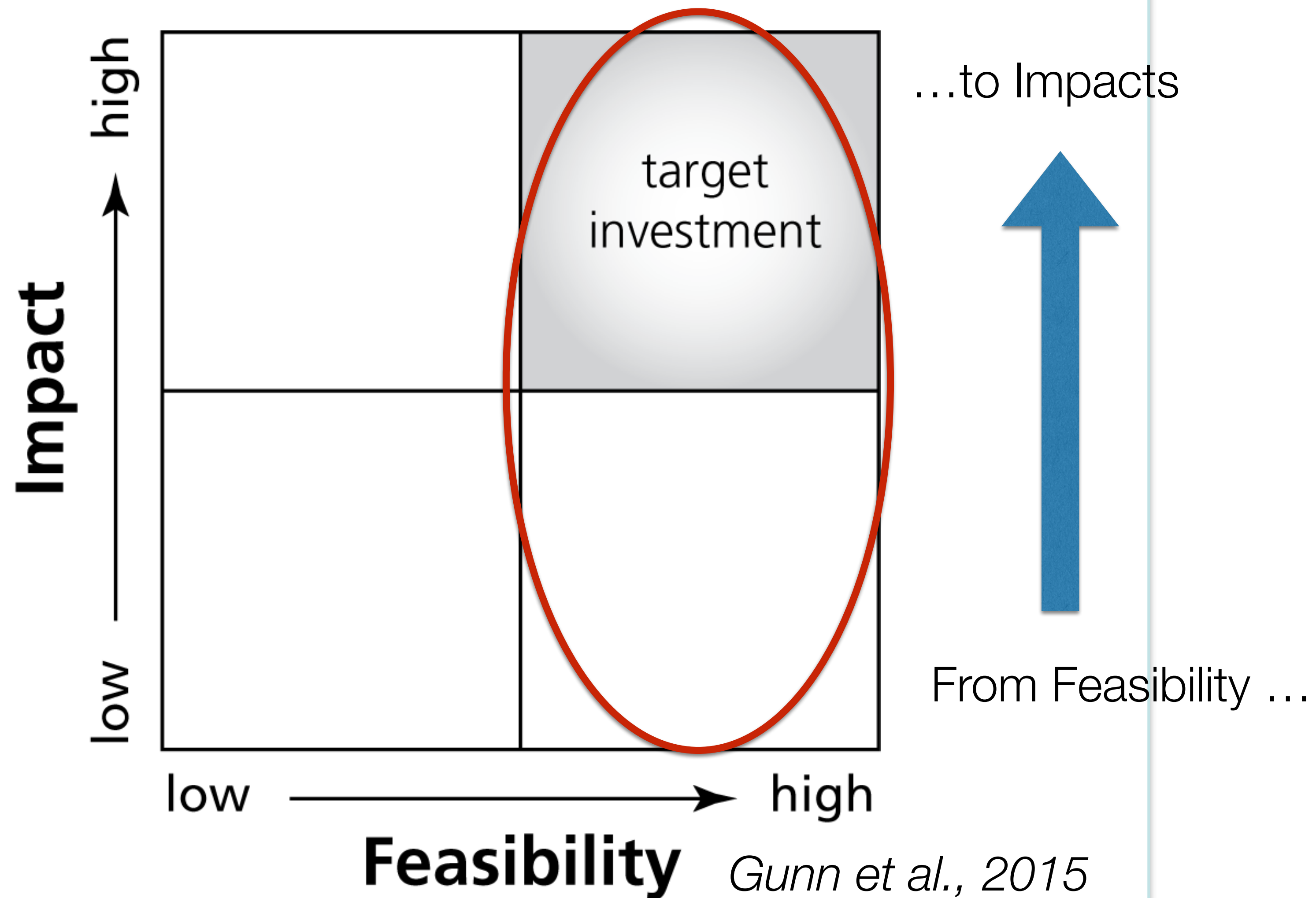
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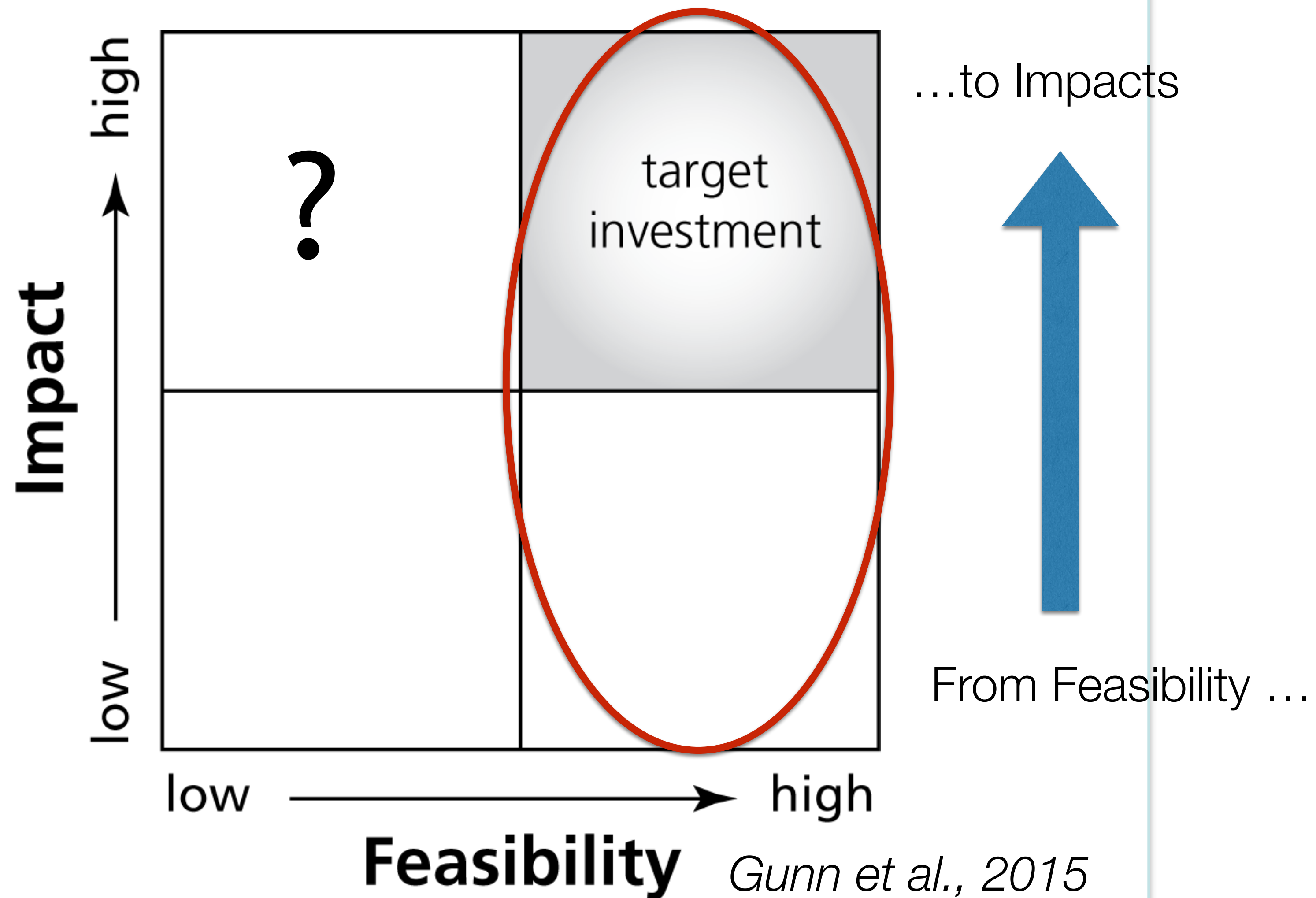
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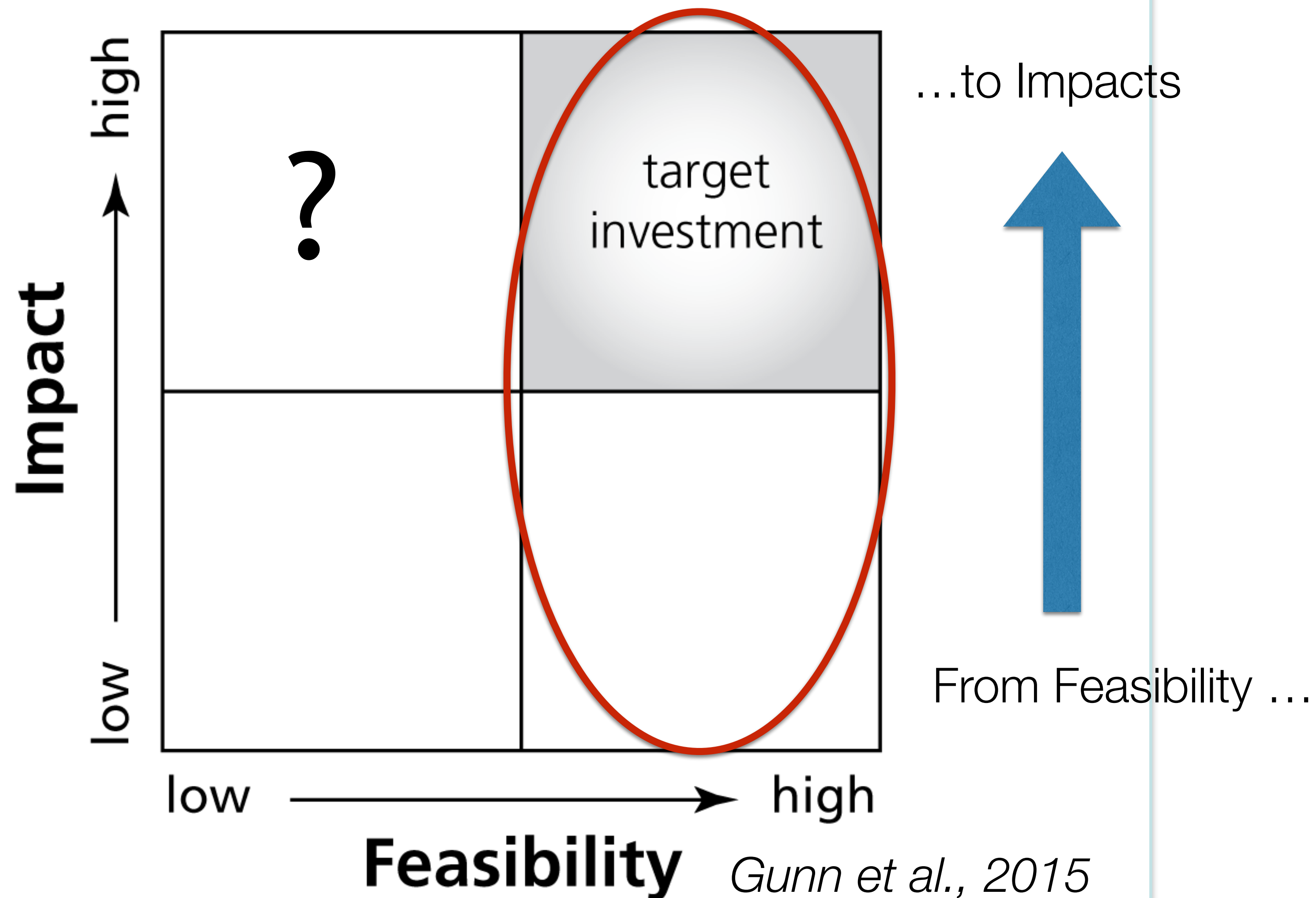
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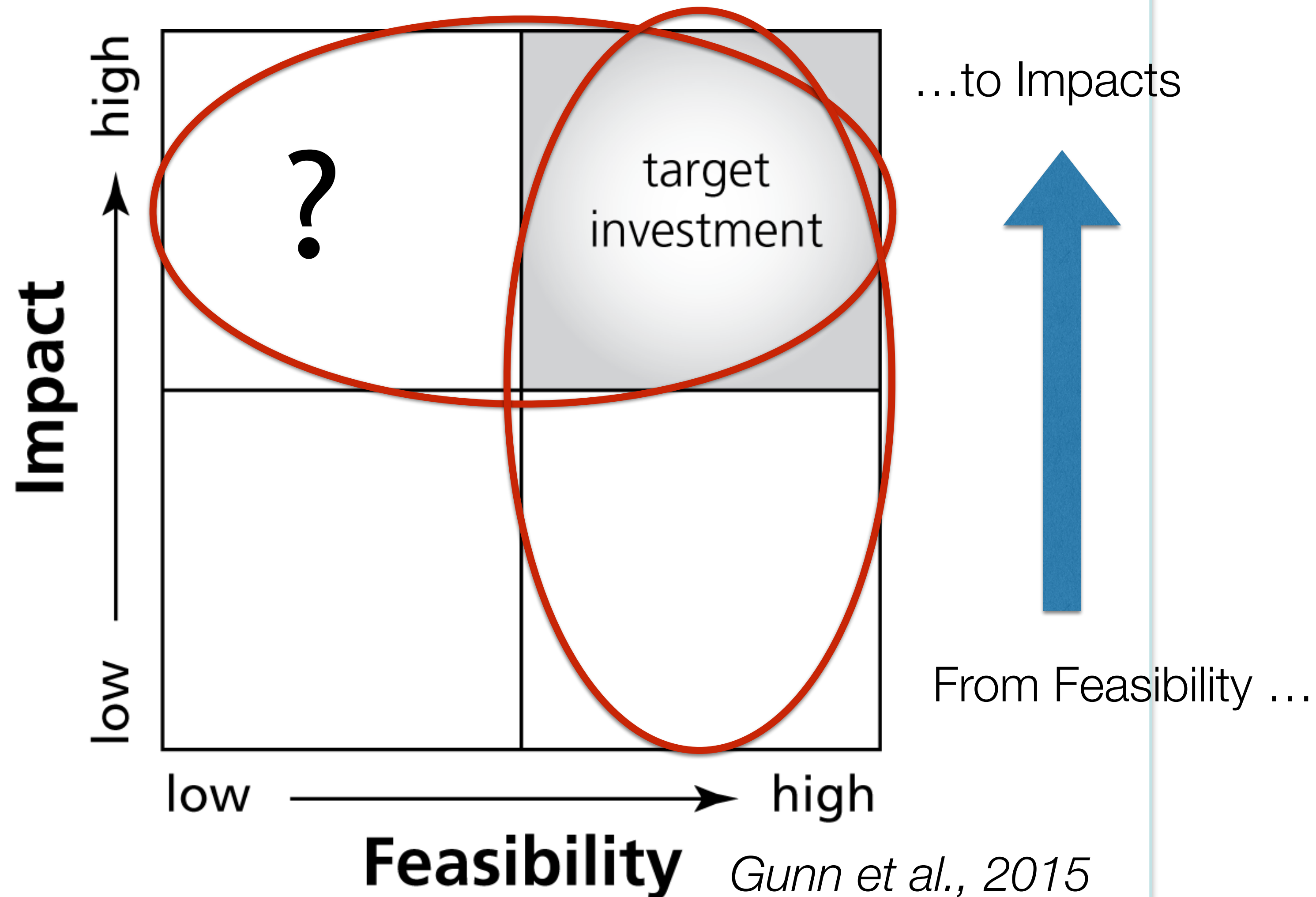
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- Societal goals may not be captured.
- Societal goals may be in the high impact, low feasibility box.
- Gap analysis should identify more than missing observations ...

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EVs: Goal-Based Approach

SDG



Target

Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Indicator

6.3.1 Percentage of wastewater safely treated

6.3.2 Percentage of bodies of water with good ambient water quality

Jill, can you provide...?

Essential Variable

Water usage
Wastewater treated

Water quality

Jack wants ...

Governance/policy

Socio-Economic

Infrastructure

Environmental

Jules-Plag and Plag, 2016b

EVs: Goal-Based Approach

SDG



Target

1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance

Indicator

1.4.1* Proportion of the population living in households with access to basic services

Essential Variable

Water Supply S.

Electricity Supply S.

Sewage S.

...

Communication S.

Public Health S.

Governance/policy

Socio-Economic

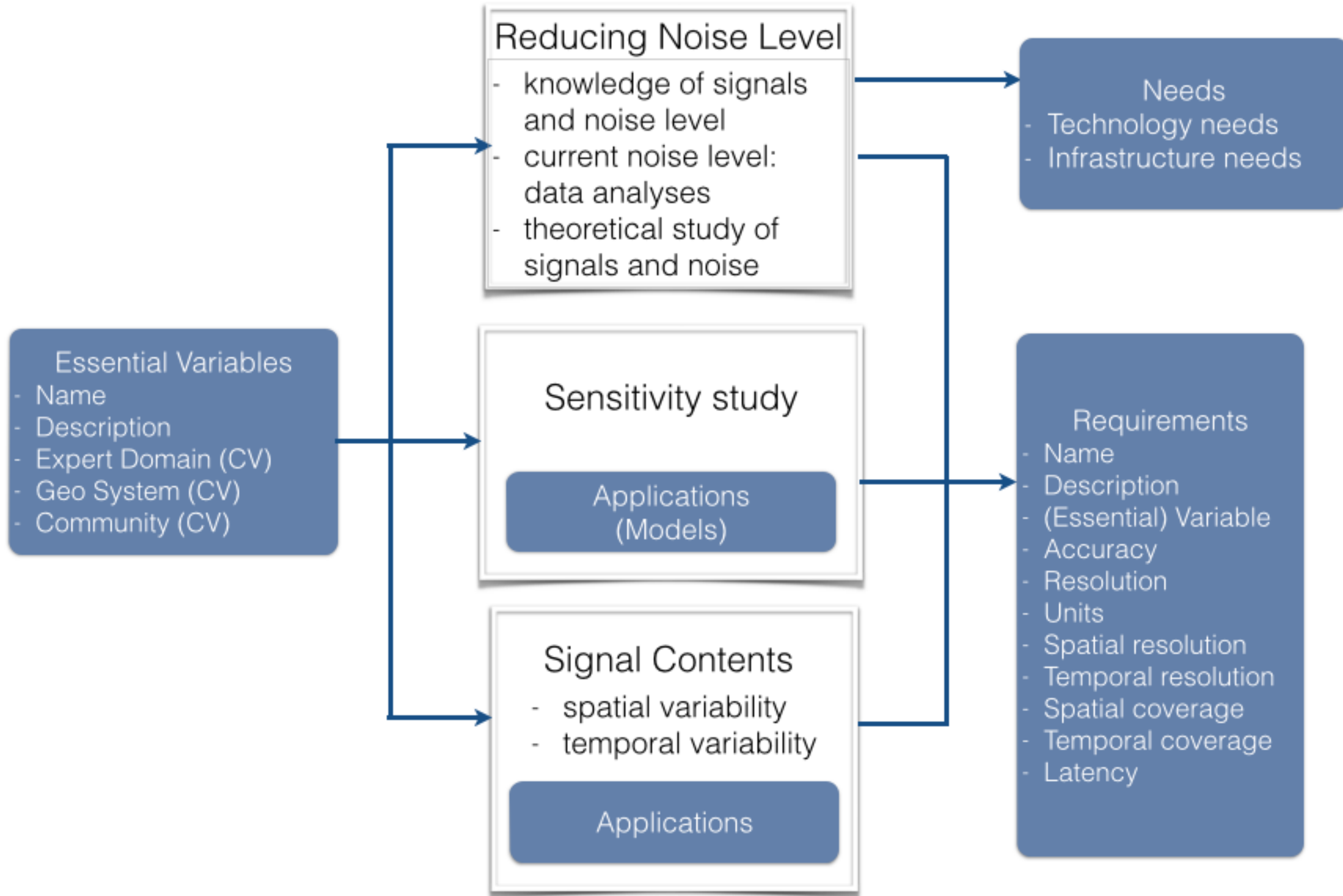
Infrastructure

Environmental

Jules-Plag and Plag, 2016b



From EVs to Requirements



Paradigm

“Sustainable Development is a development that meets the needs of the present while safeguarding Earth’s life support systems, on which the welfare of current and future generations depends.” (Griggs et al., 2013)

Paradigm

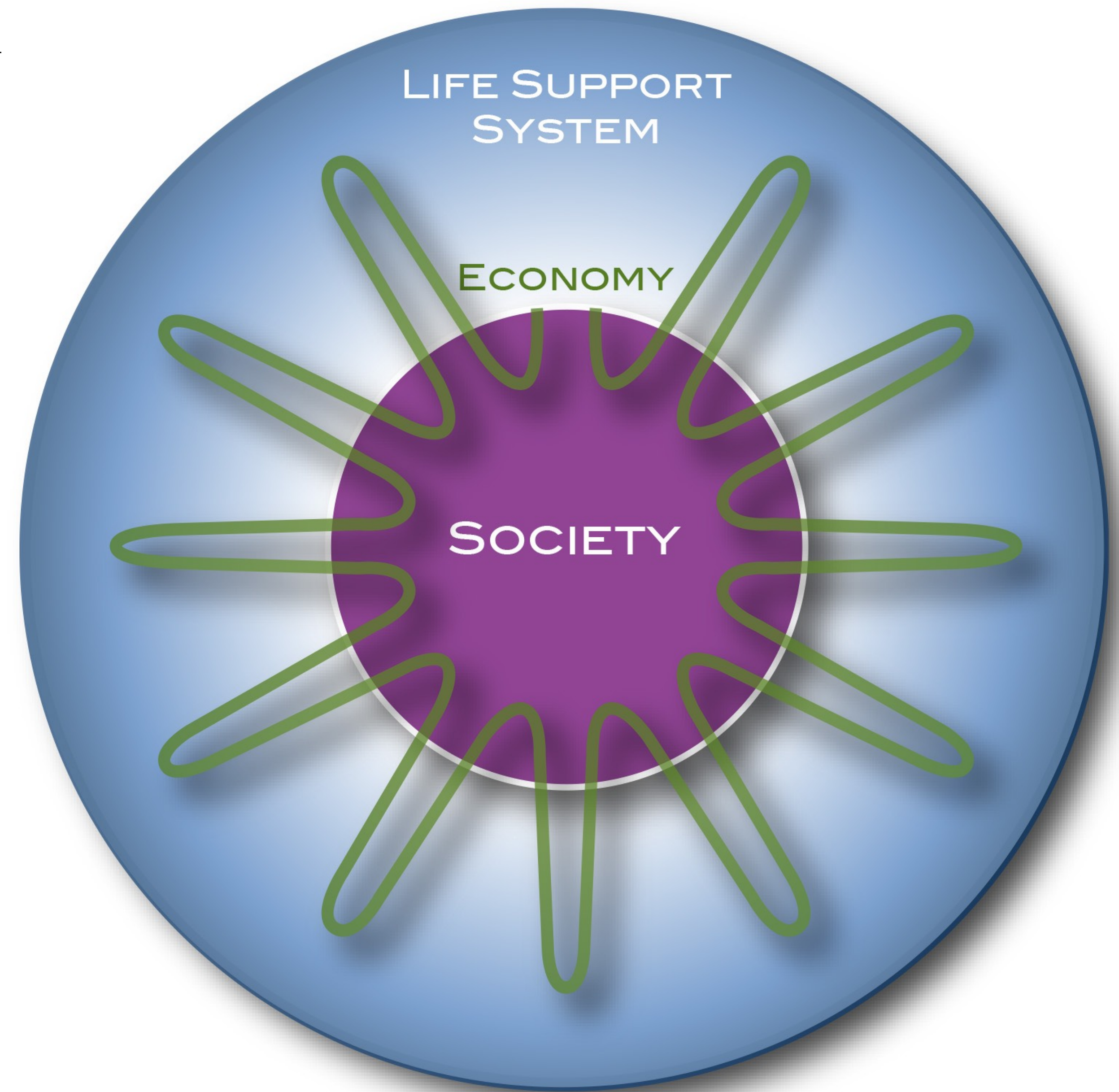
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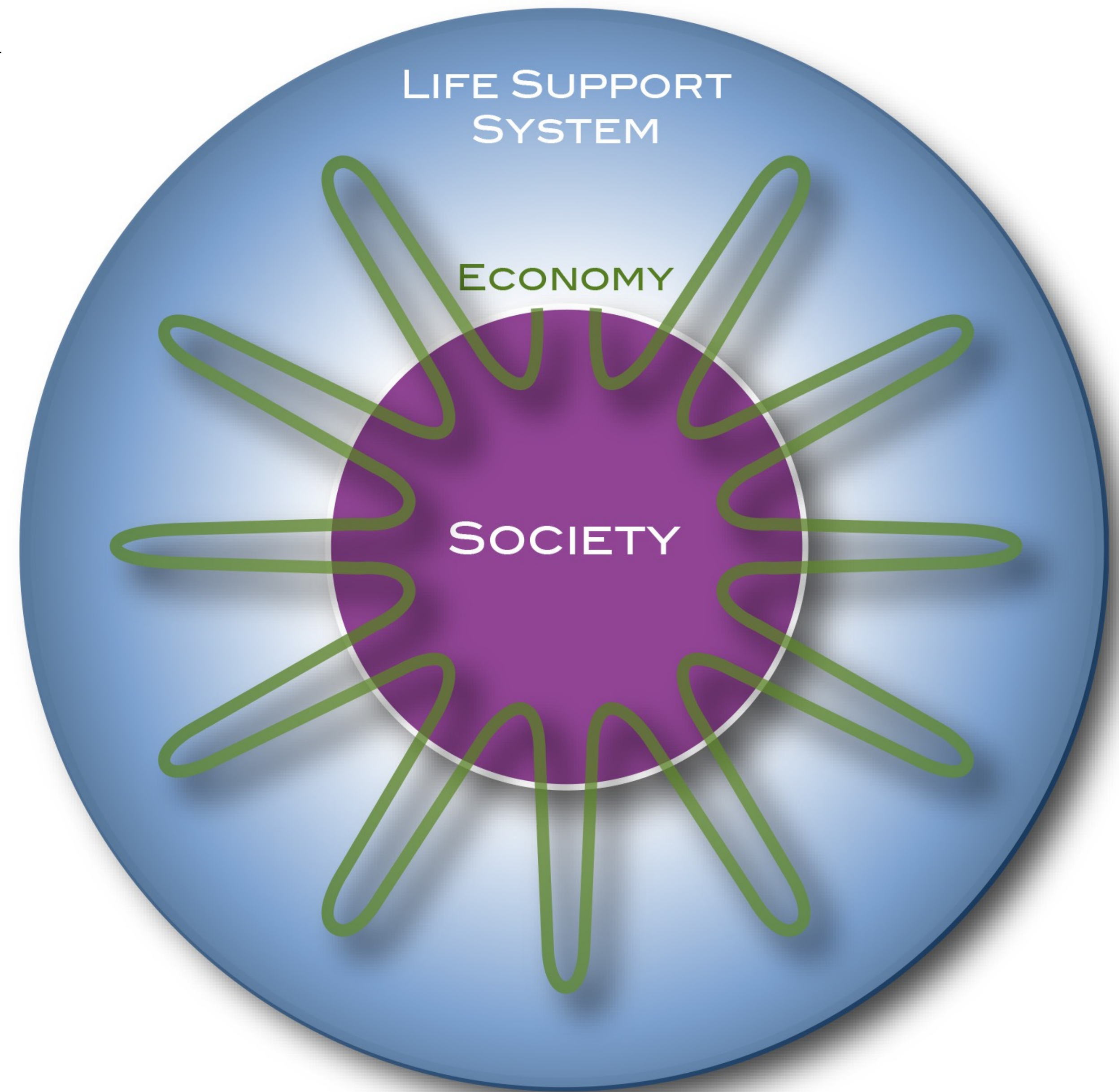
Flows between humanity and the Earth’s life-support system are controlled by economic rules and social and ethical norms.



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Flows between humanity and the Earth’s life-support system are controlled by economic rules and social and ethical norms.



We are the operators of Earth’s life-support system

System State



Time

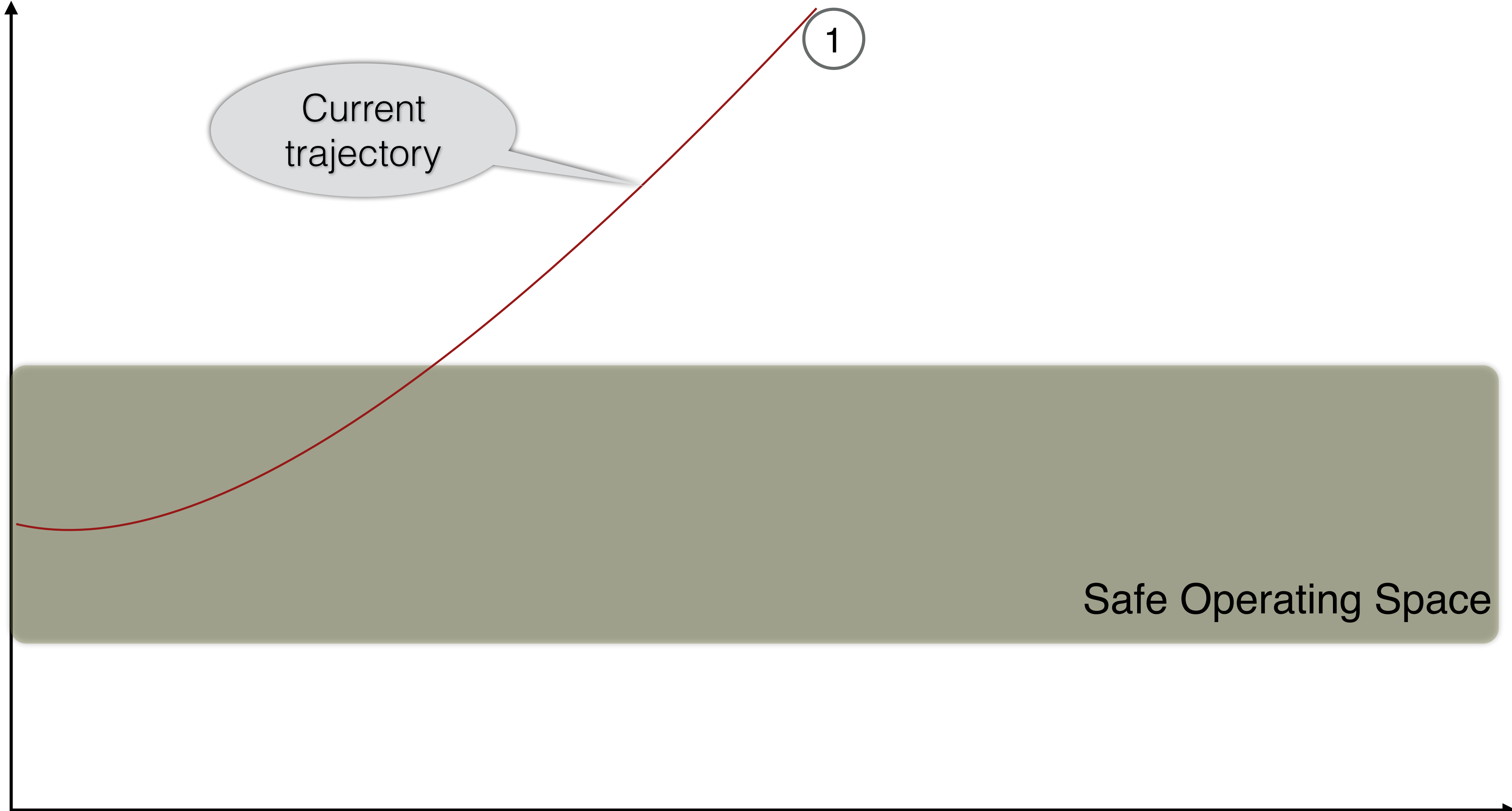
System State



Safe Operating Space

Time

System State



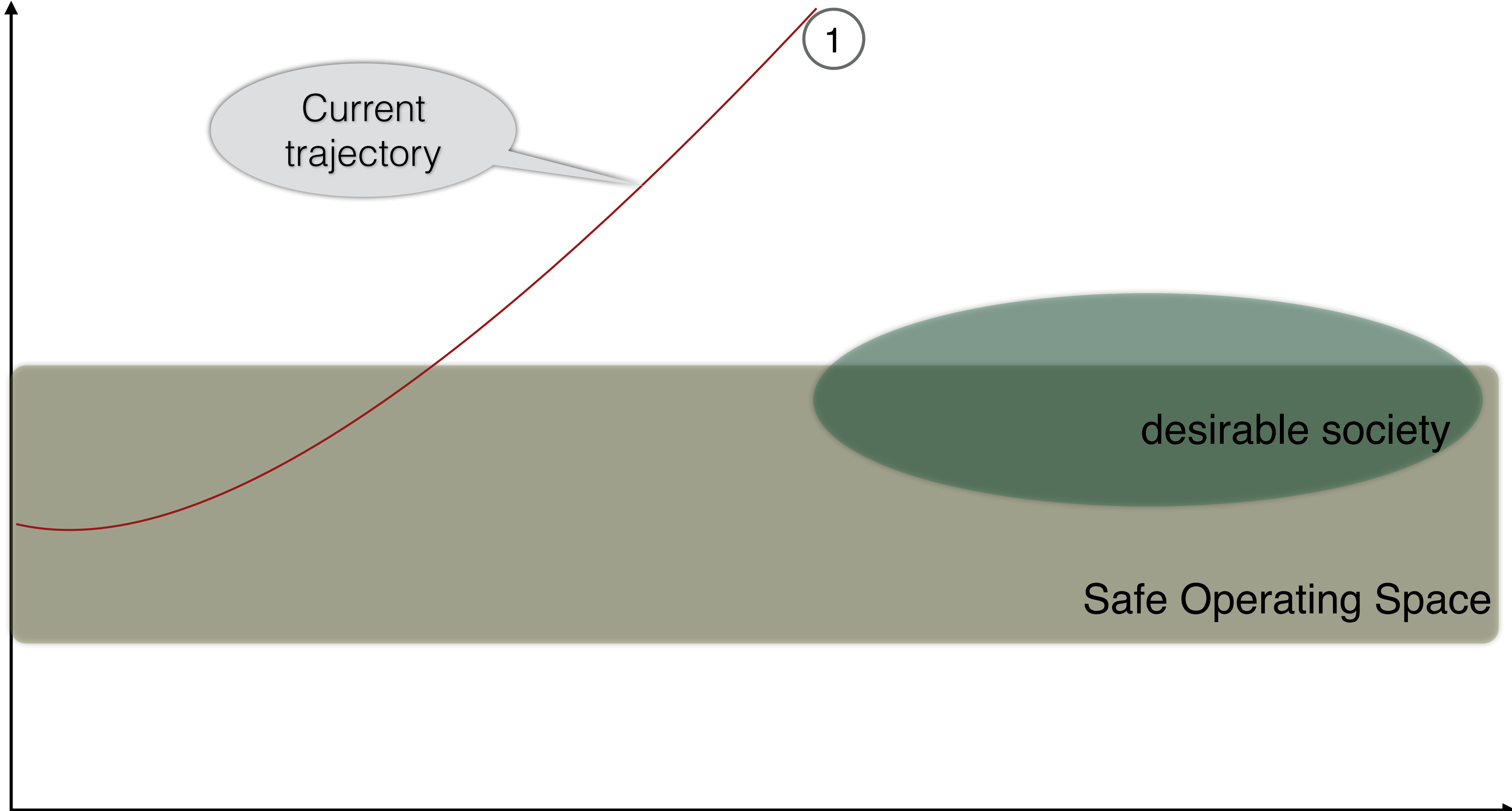
Current trajectory

1

Safe Operating Space

Time

System State



Current trajectory

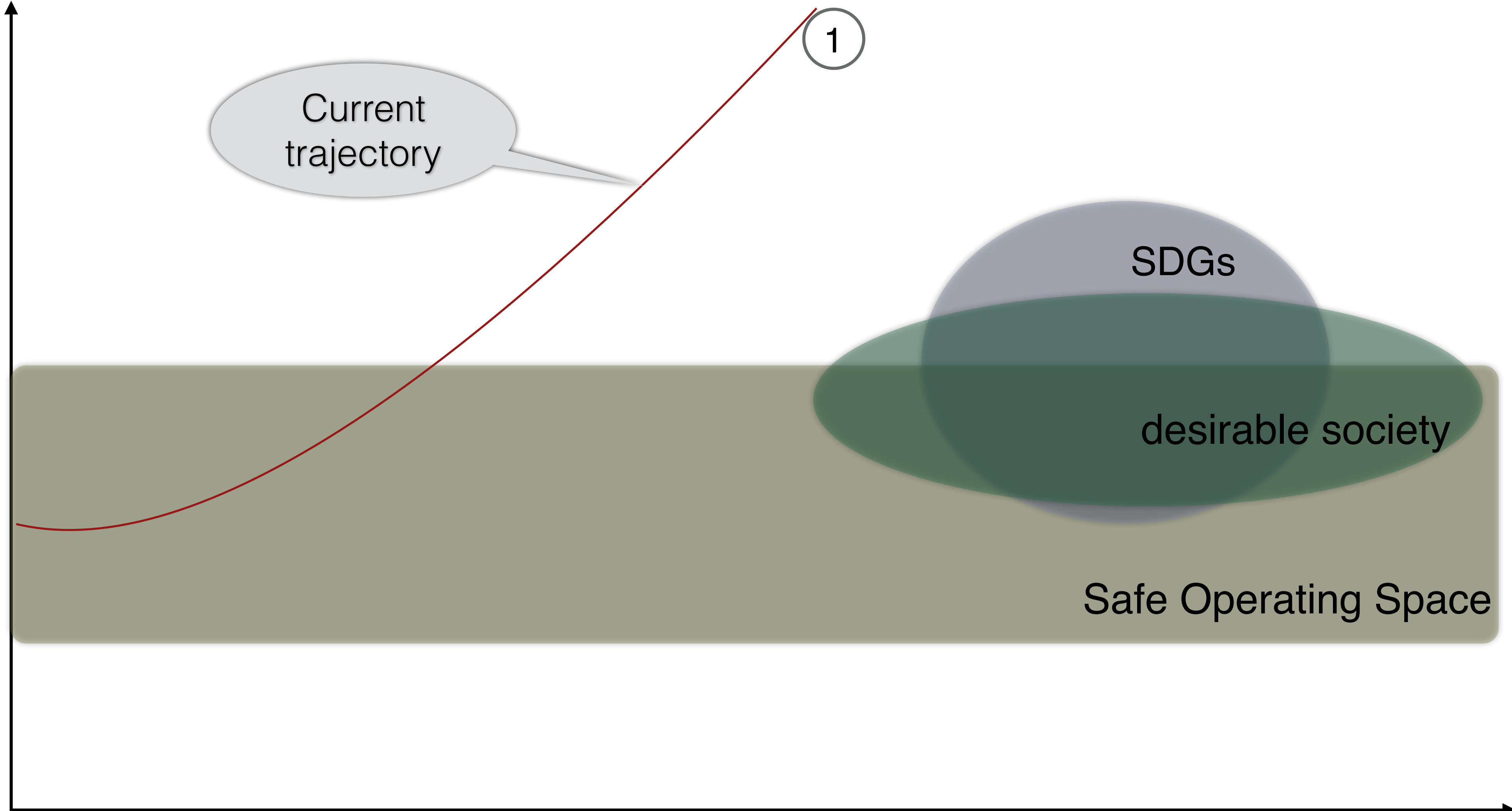
1

desirable society

Safe Operating Space

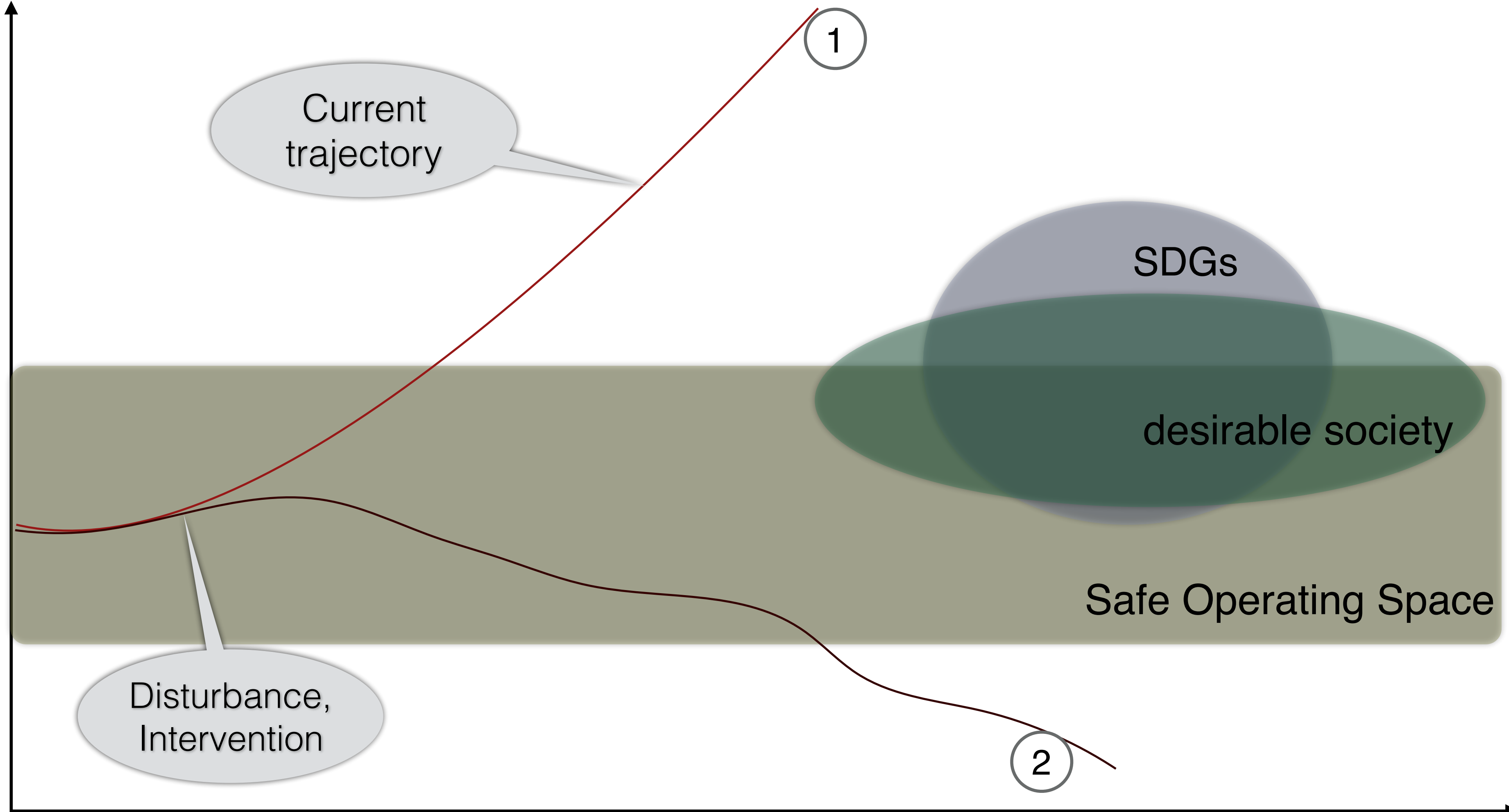
Time

System State



Time

System State



Current trajectory

1

SDGs

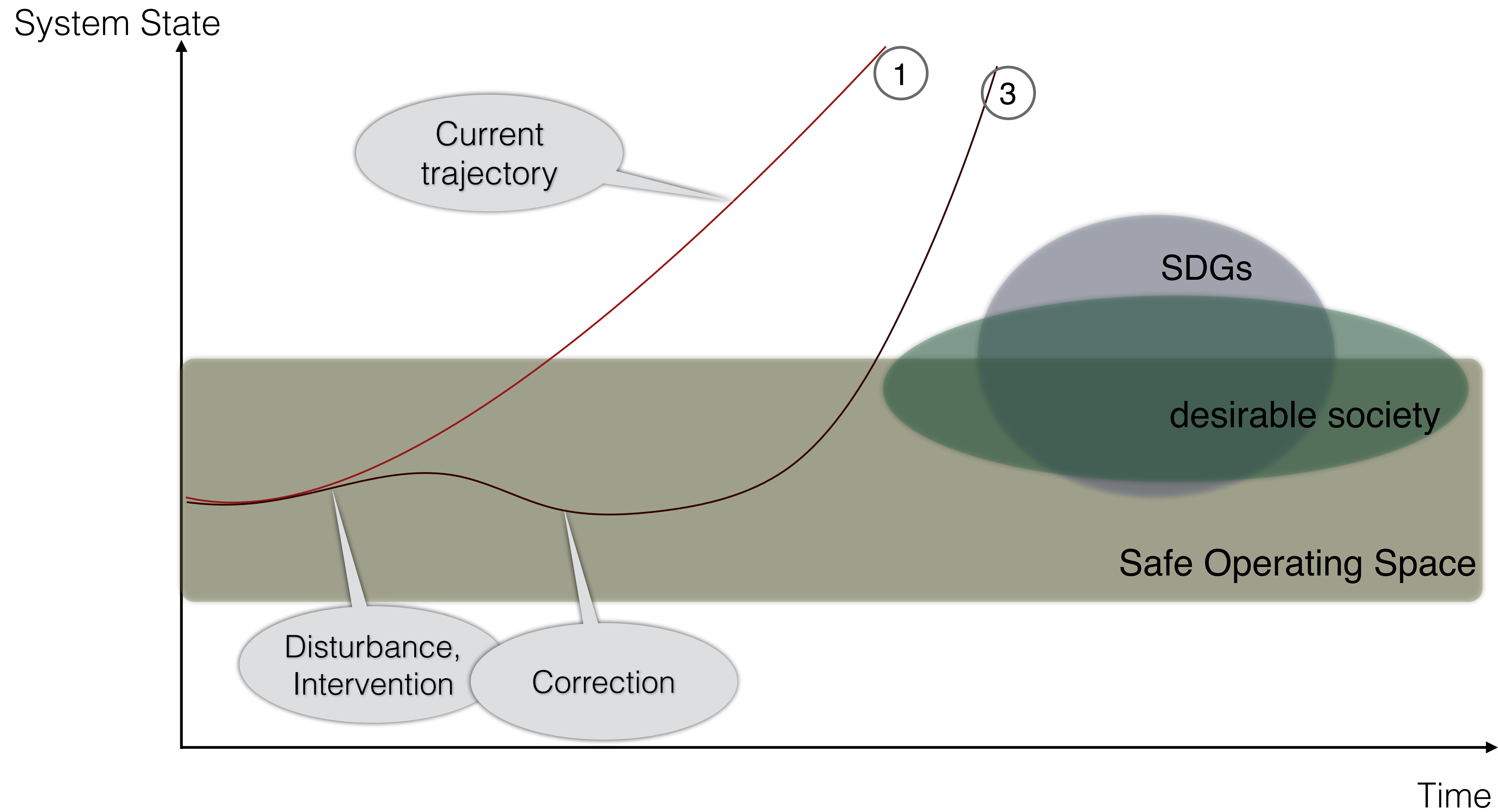
desirable society

Disturbance,
Intervention

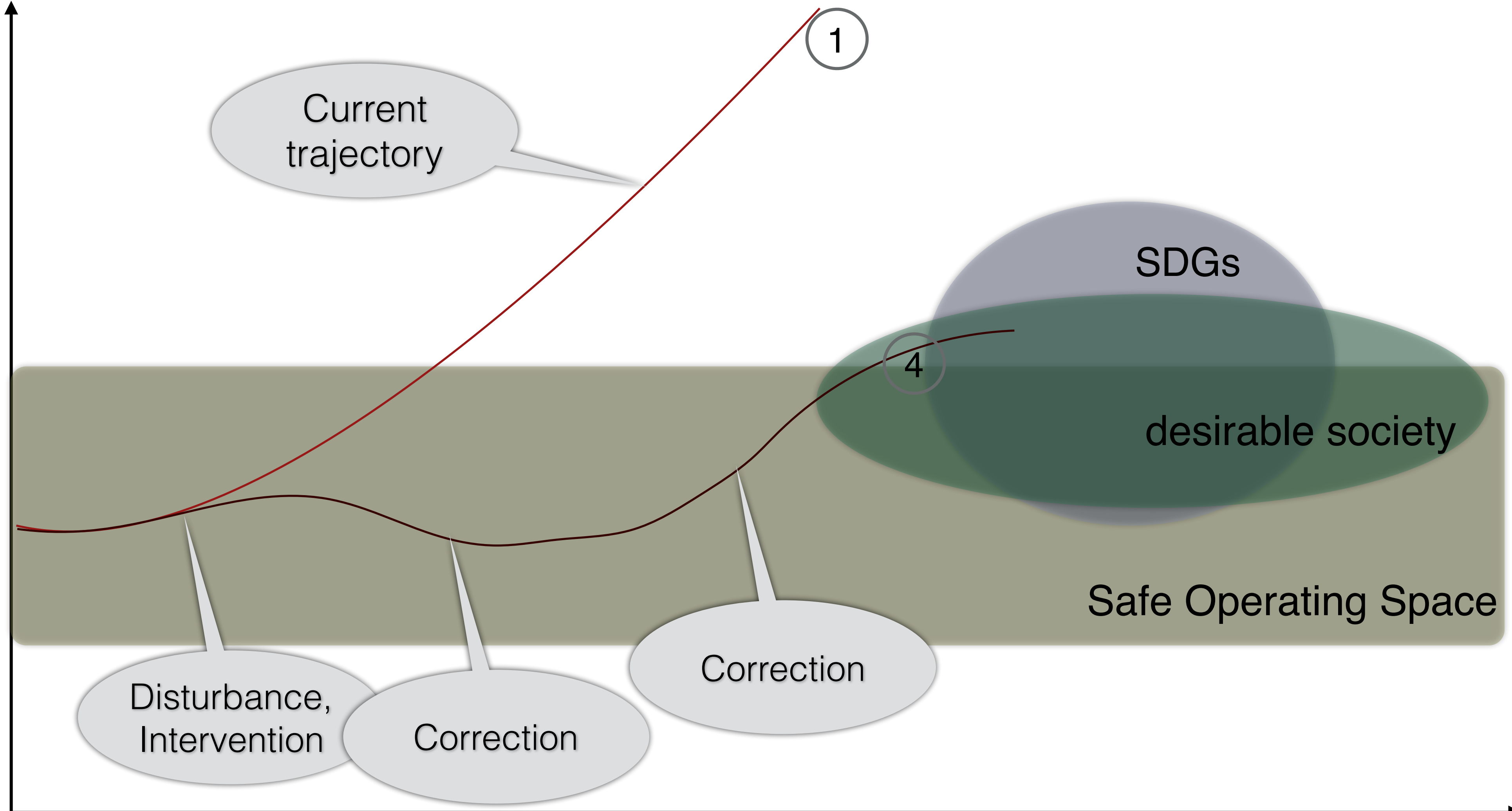
2

Safe Operating Space

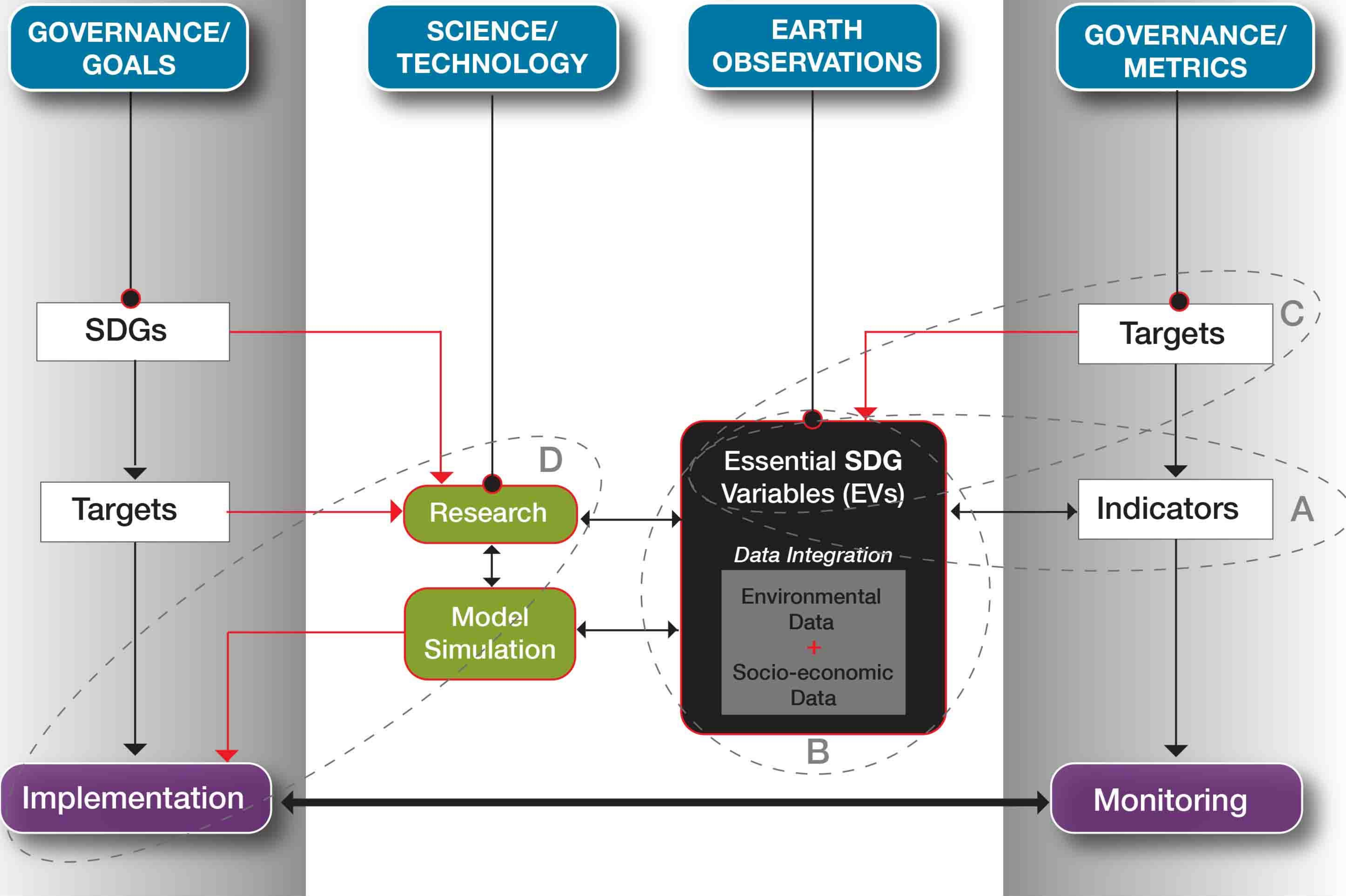
Time



System State



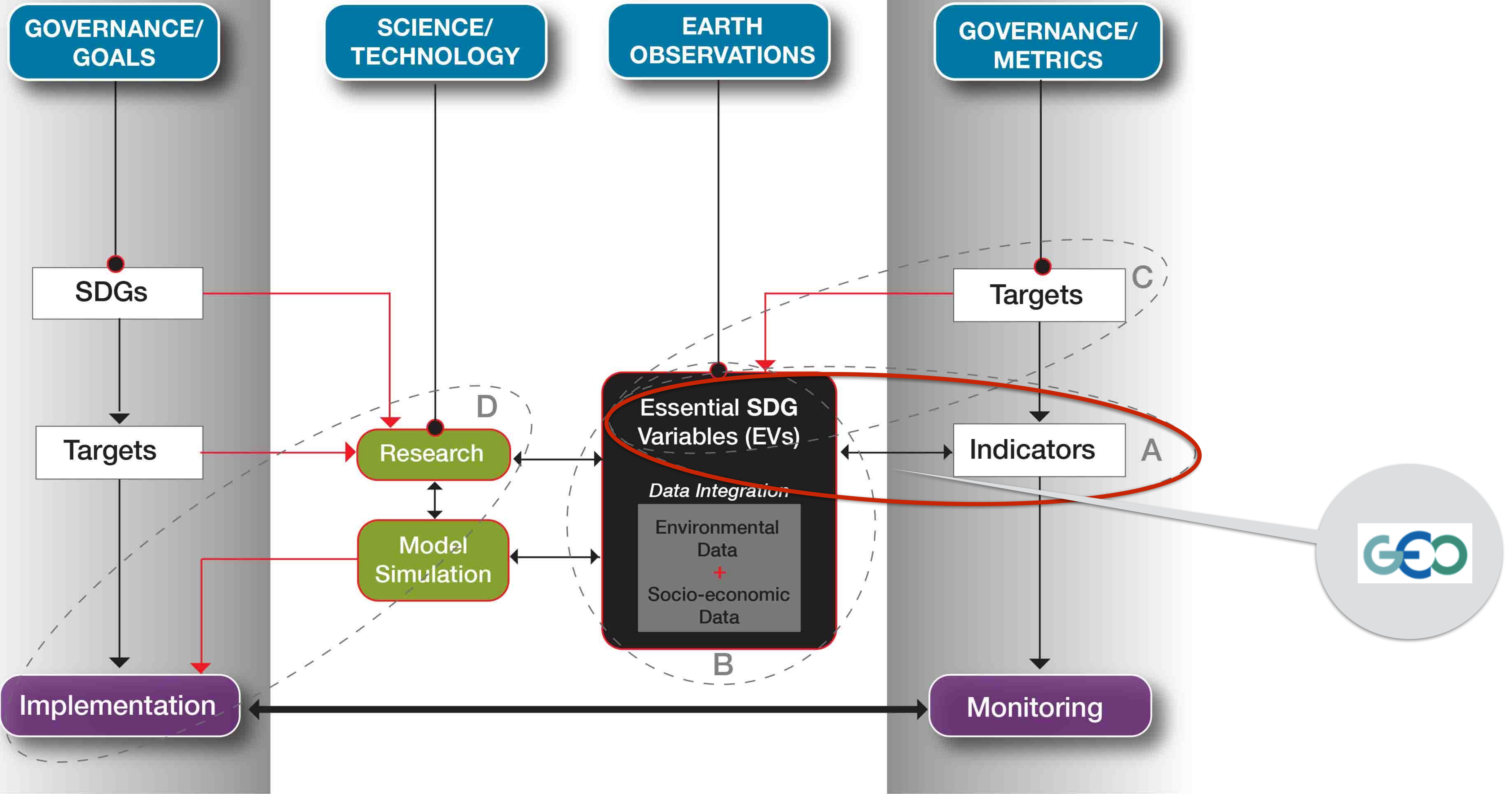
Time



Process

Jules-Plag and Plag, 2016

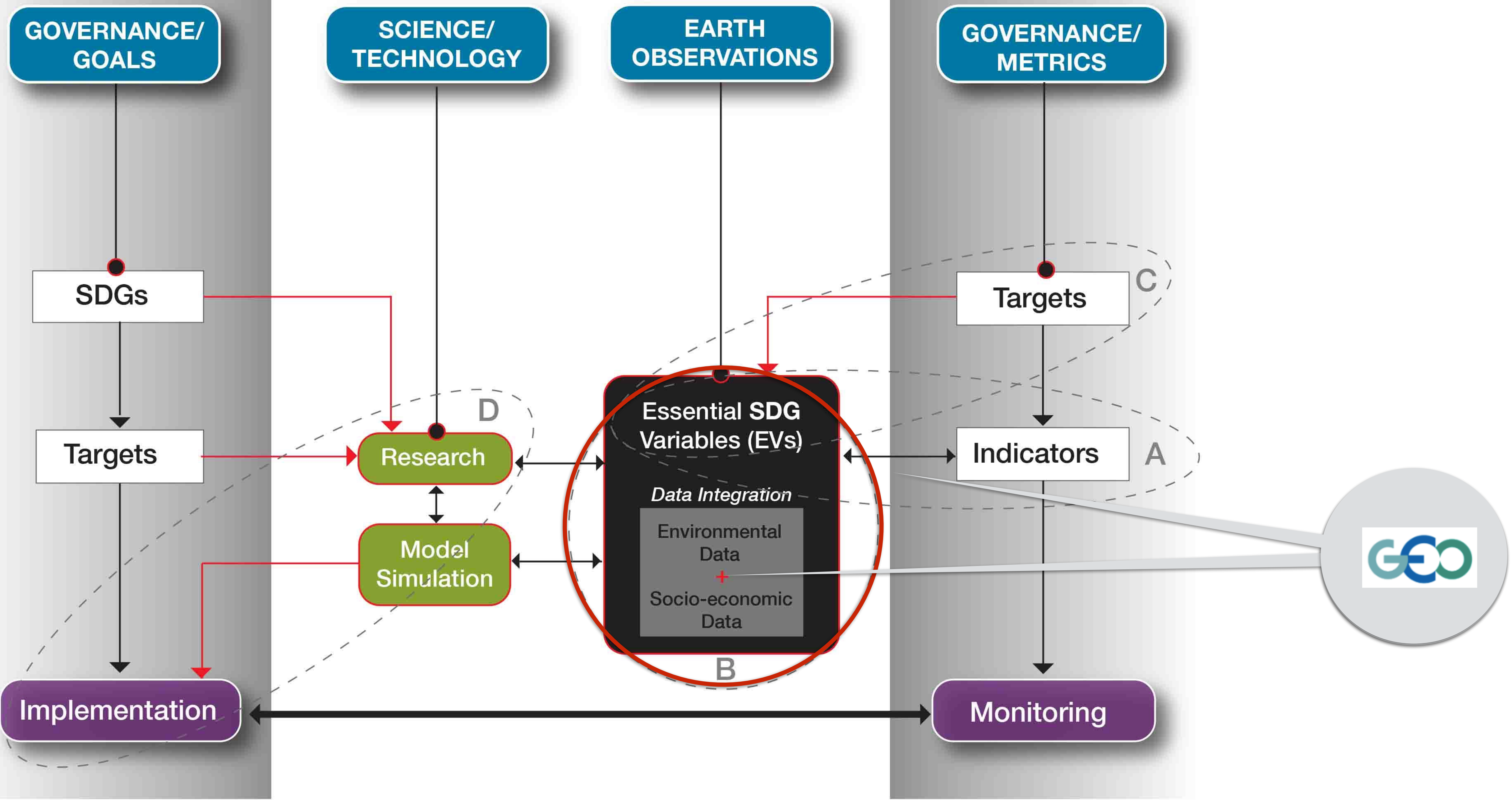
Assessment



Process

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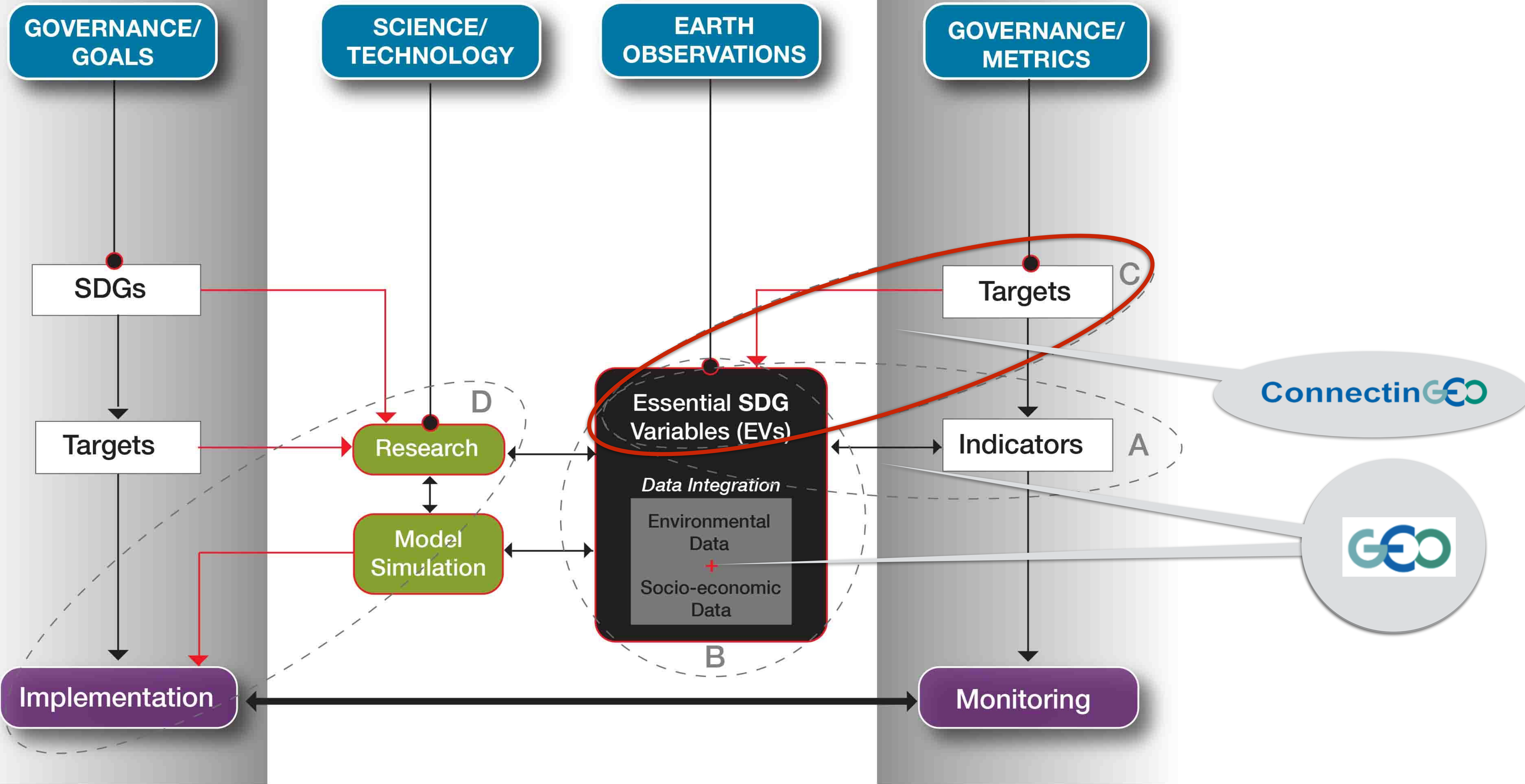
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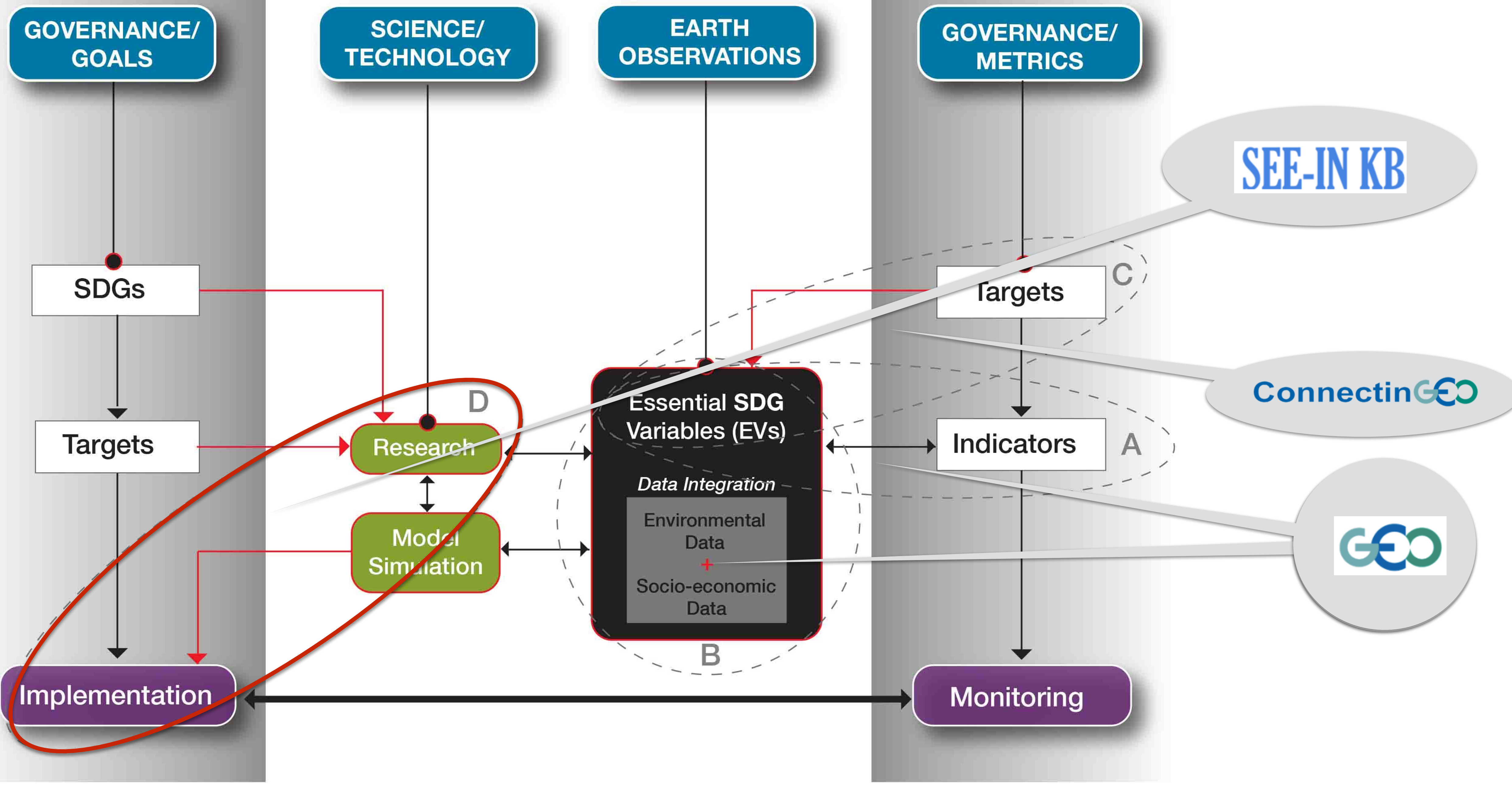
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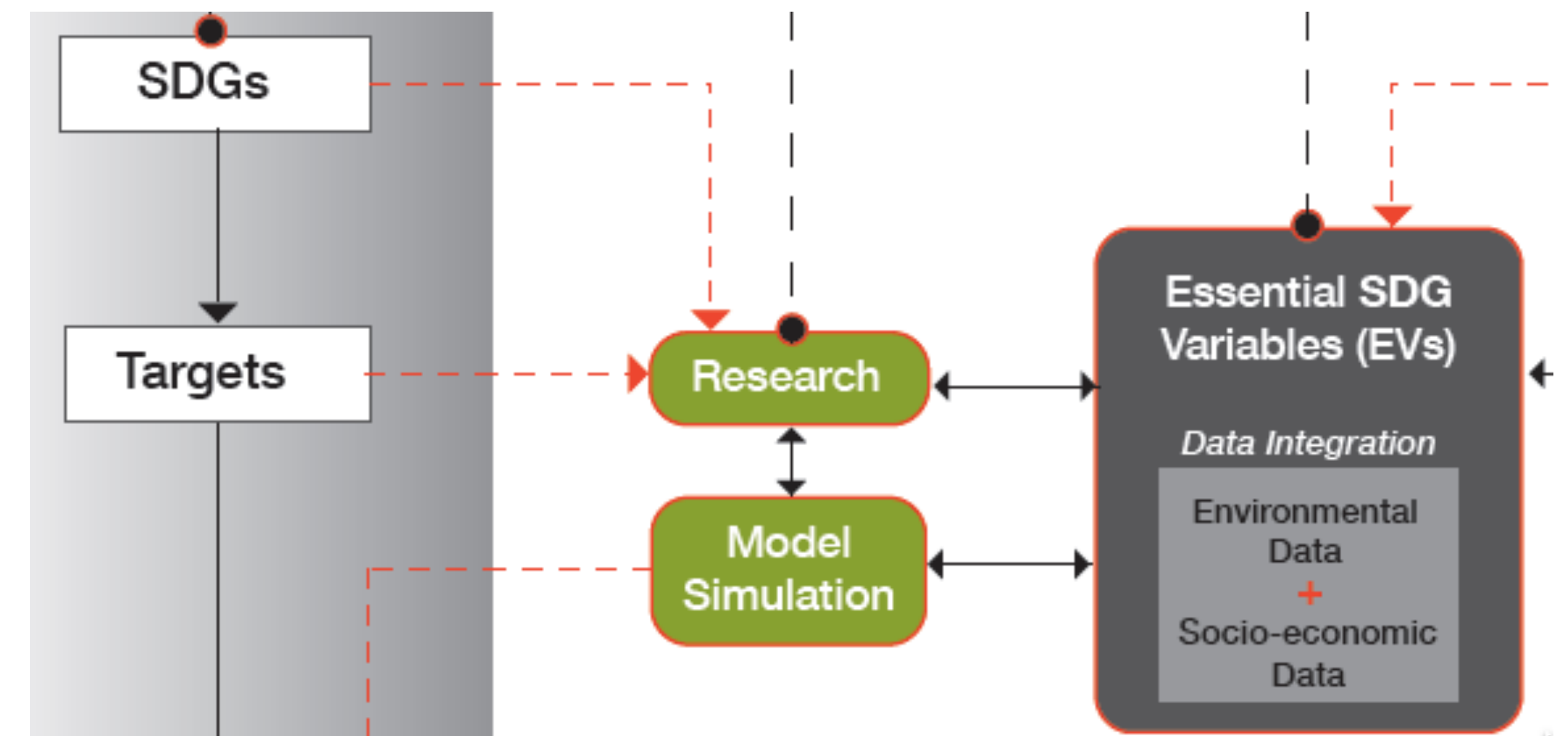
Process

Jules-Plag and Plag, 2016

Assessment

Science and EO-based decision support for SDG Implementation

- Data integration in support of research
- Data-driven simulation: “What if” questions
- Models for the socio-economic and environmental coupled system (Model Web)
- Agent-based models to account for human behavior
- Geo-Design for integration and change
- GEOSS Knowledge Base: Linking decision and policy makers to EO-derived knowledge



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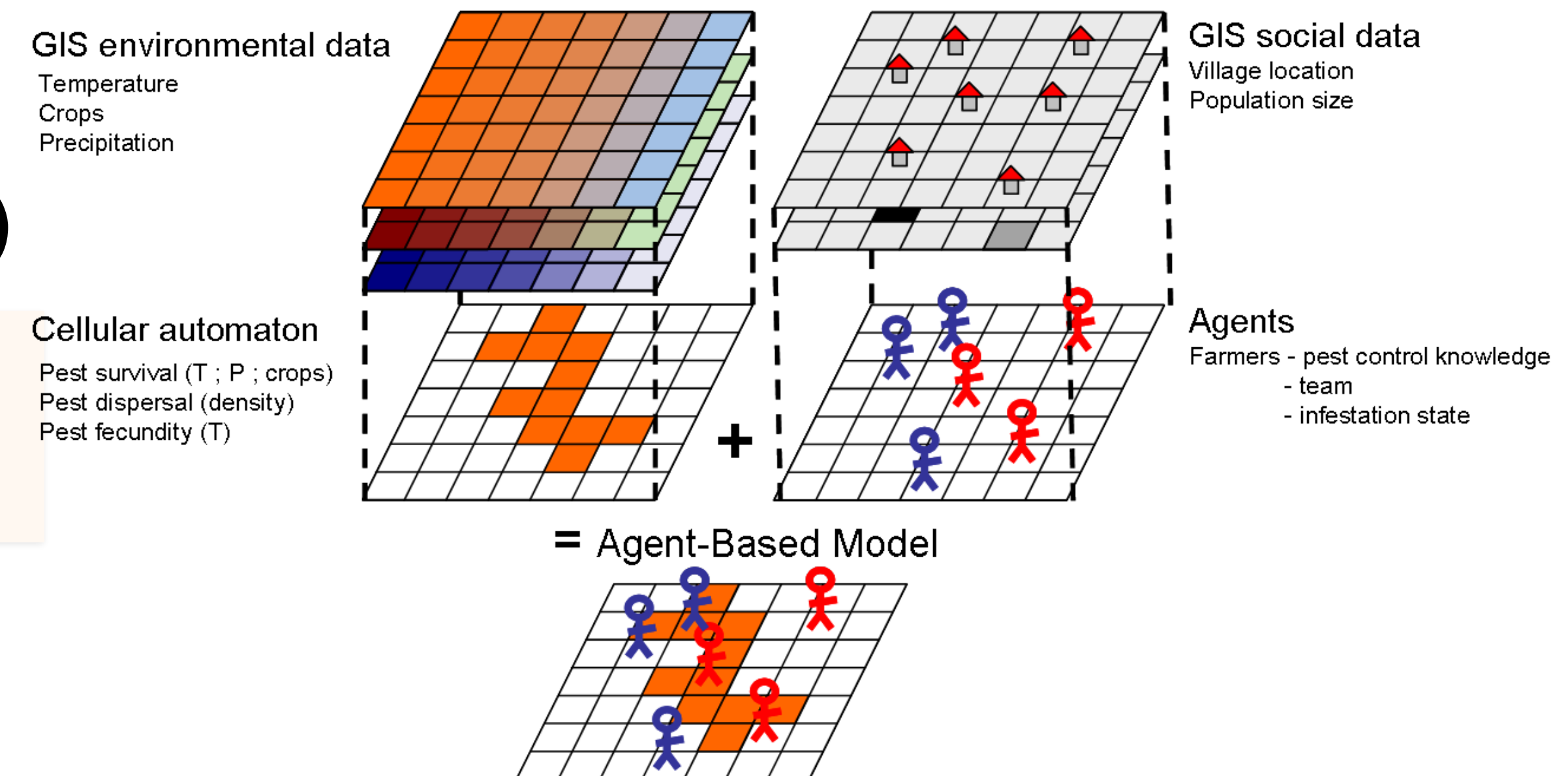
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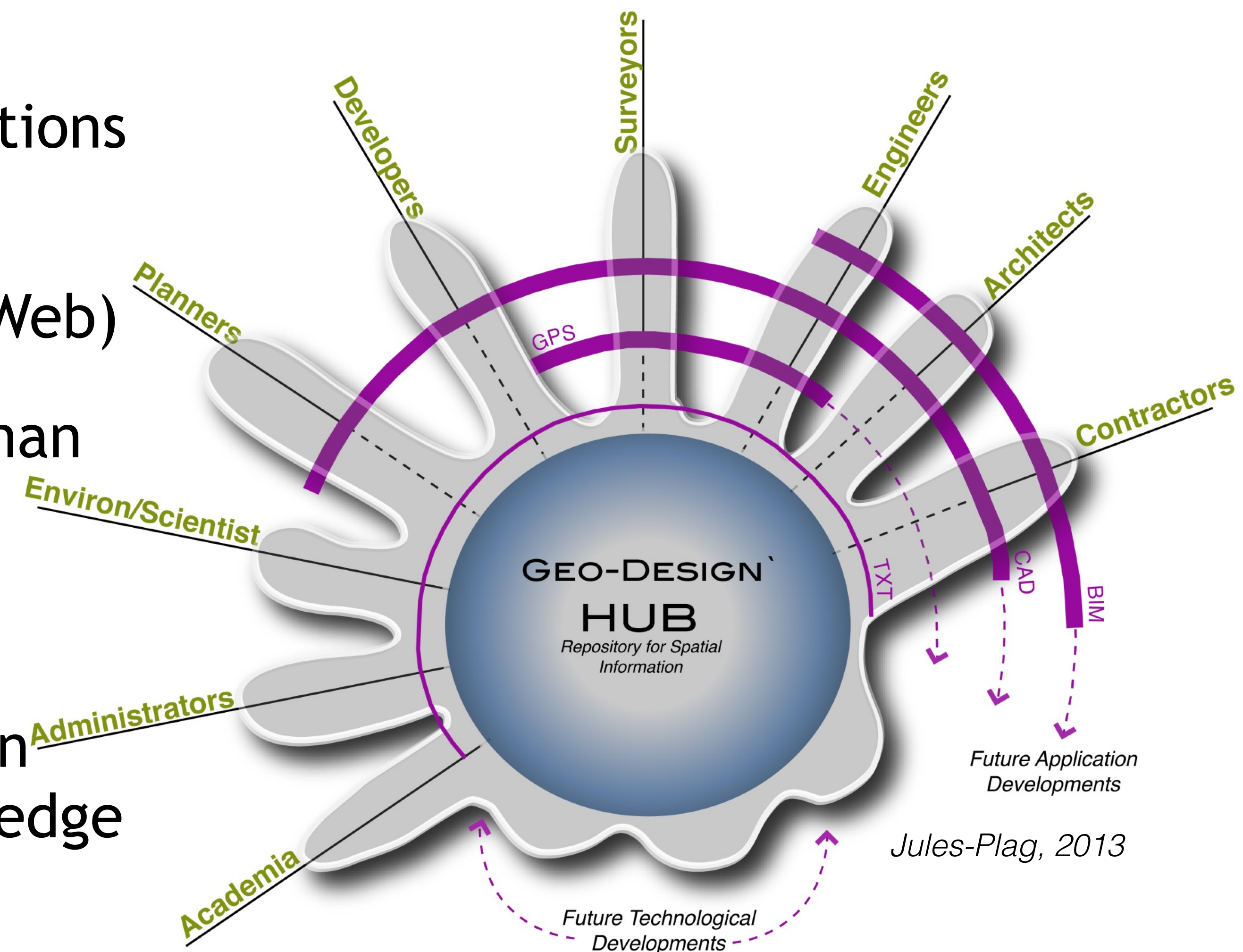
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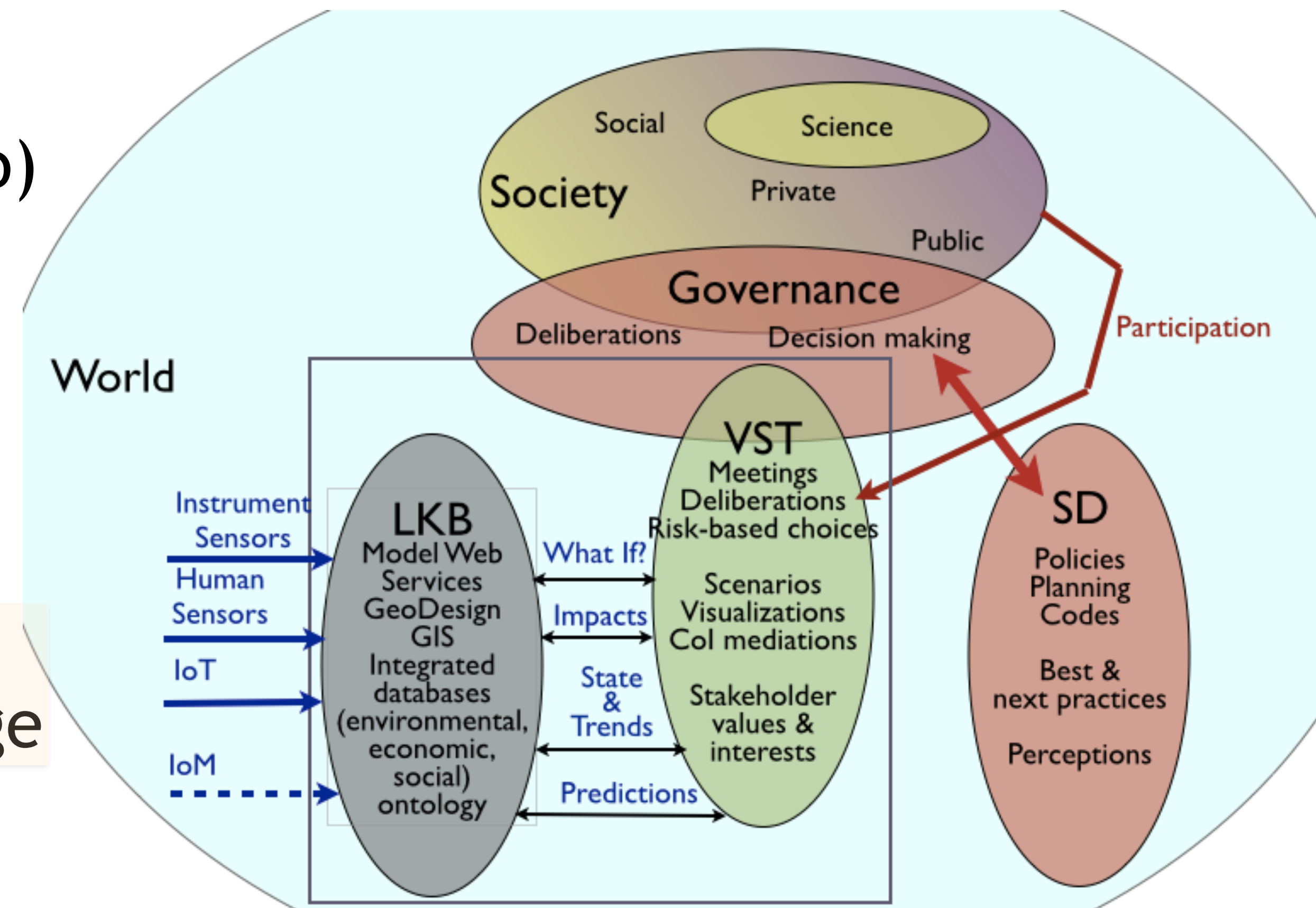
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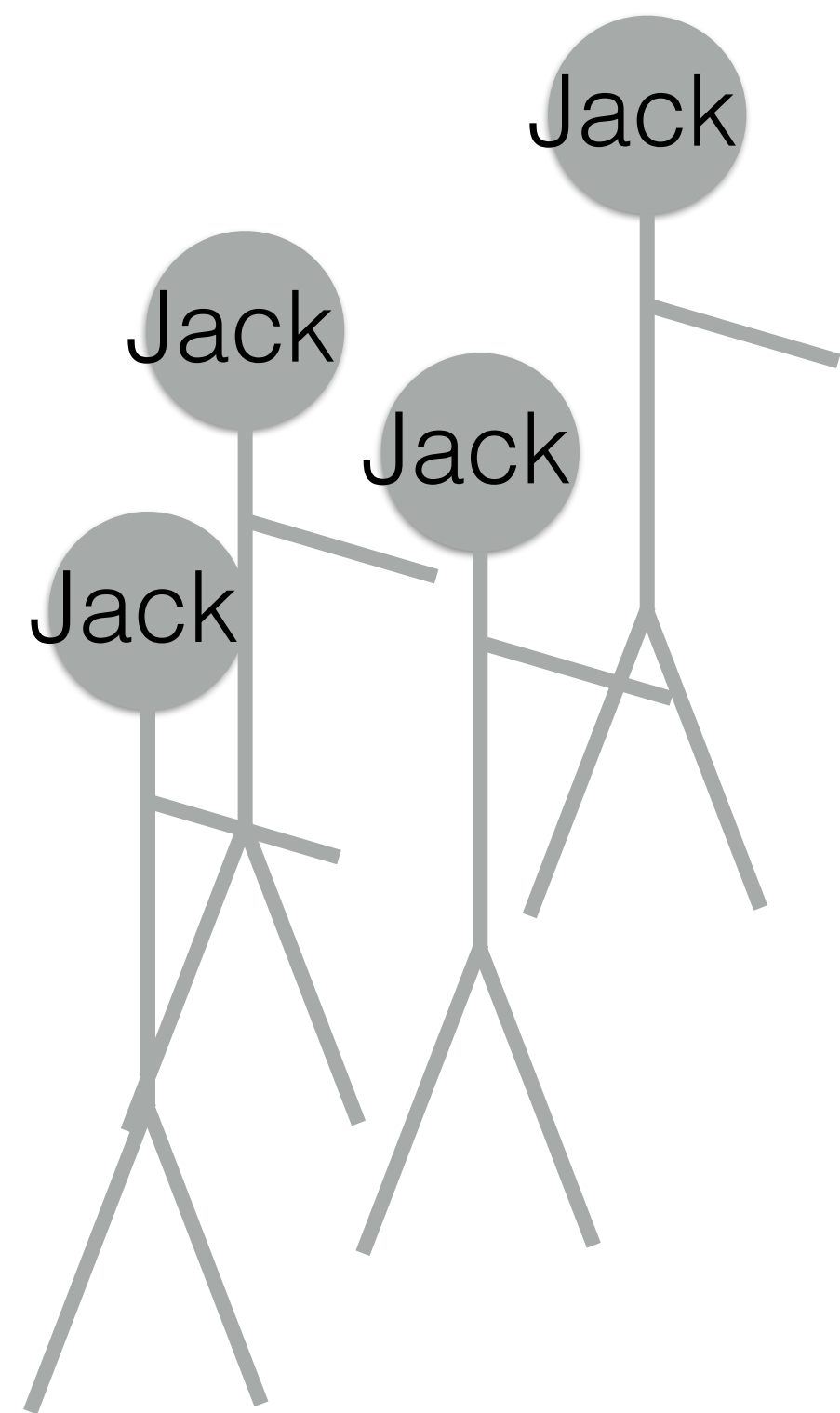
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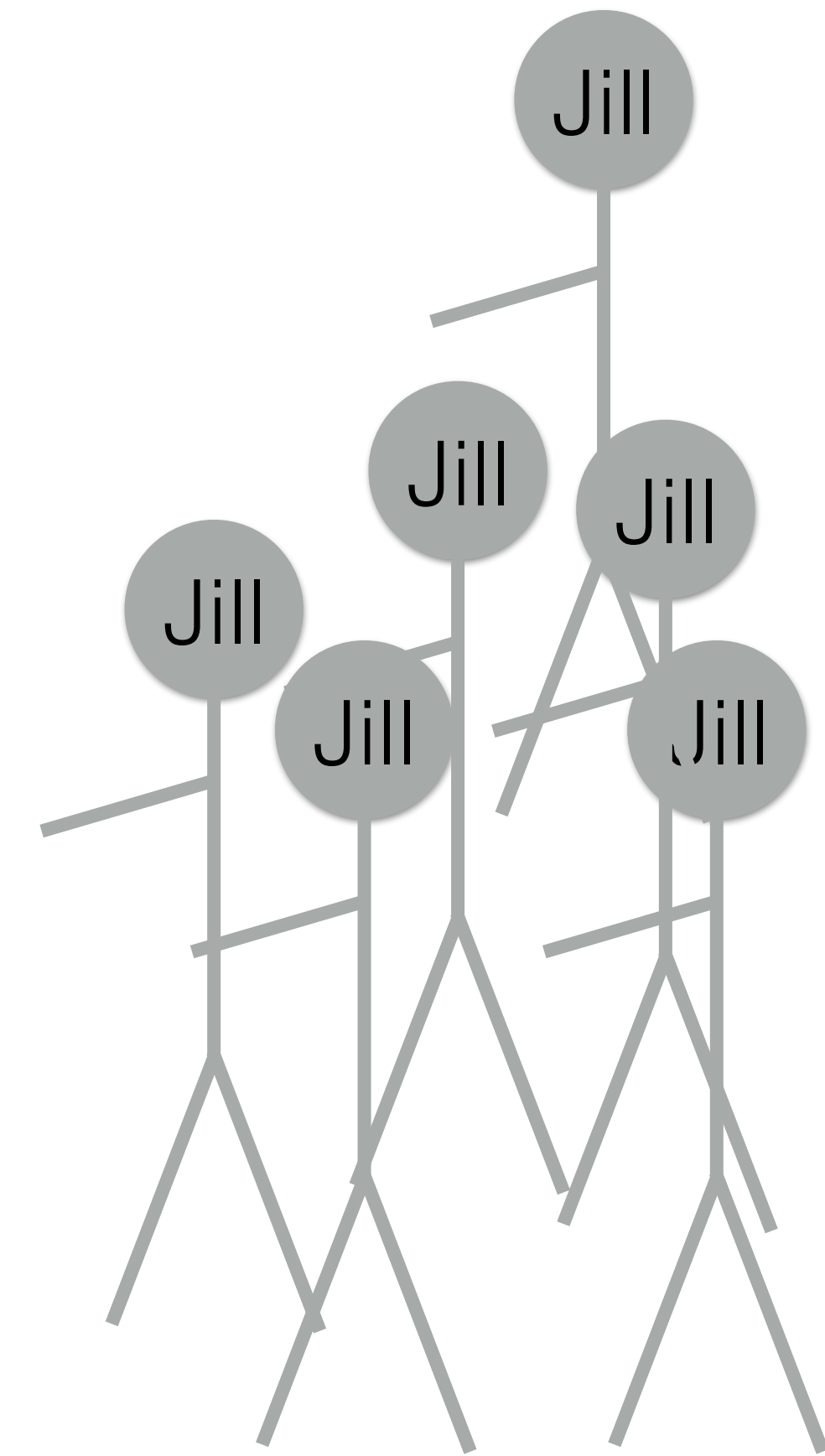


Linking Users to Knowledge

Governance/Science/Private

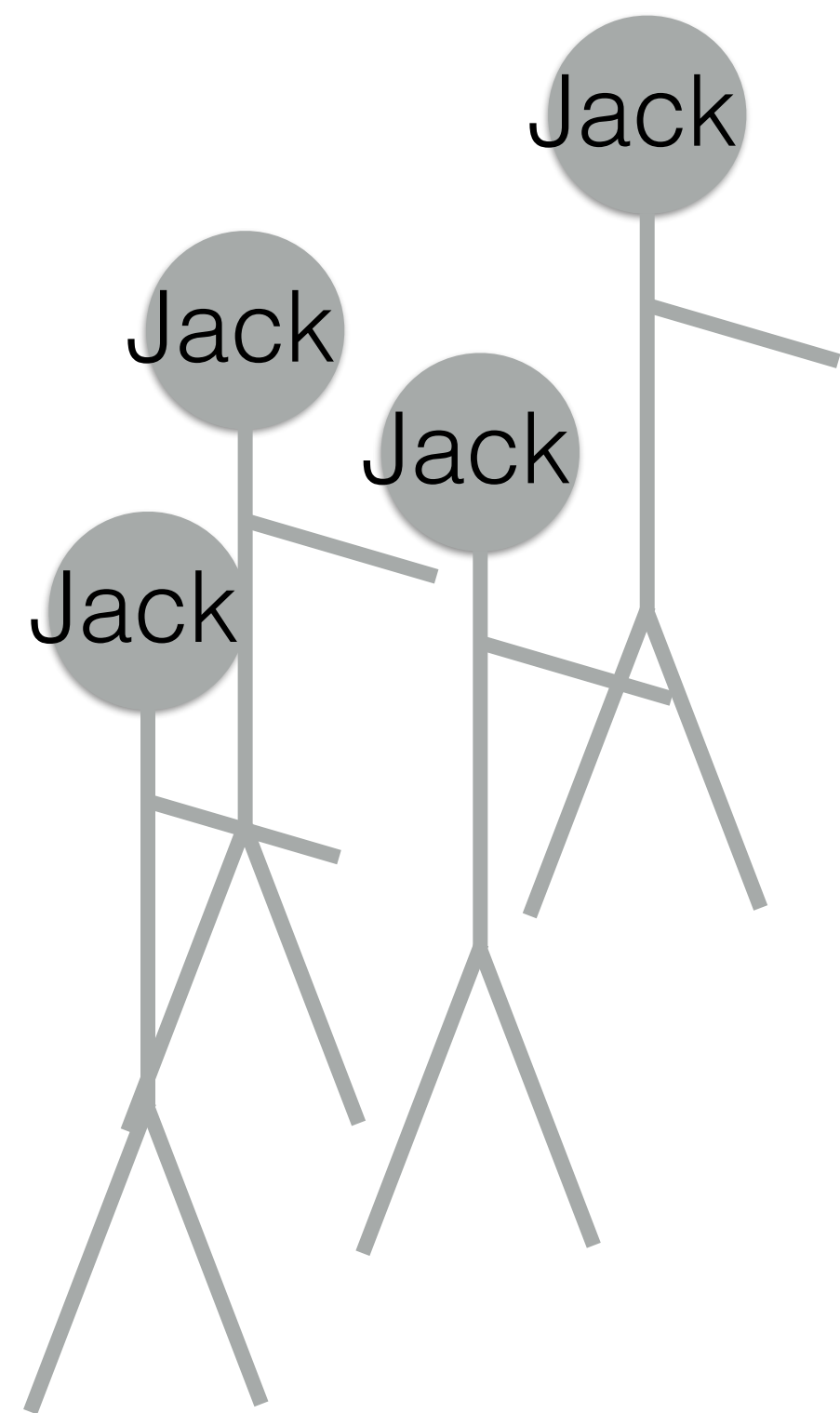


Earth Observation

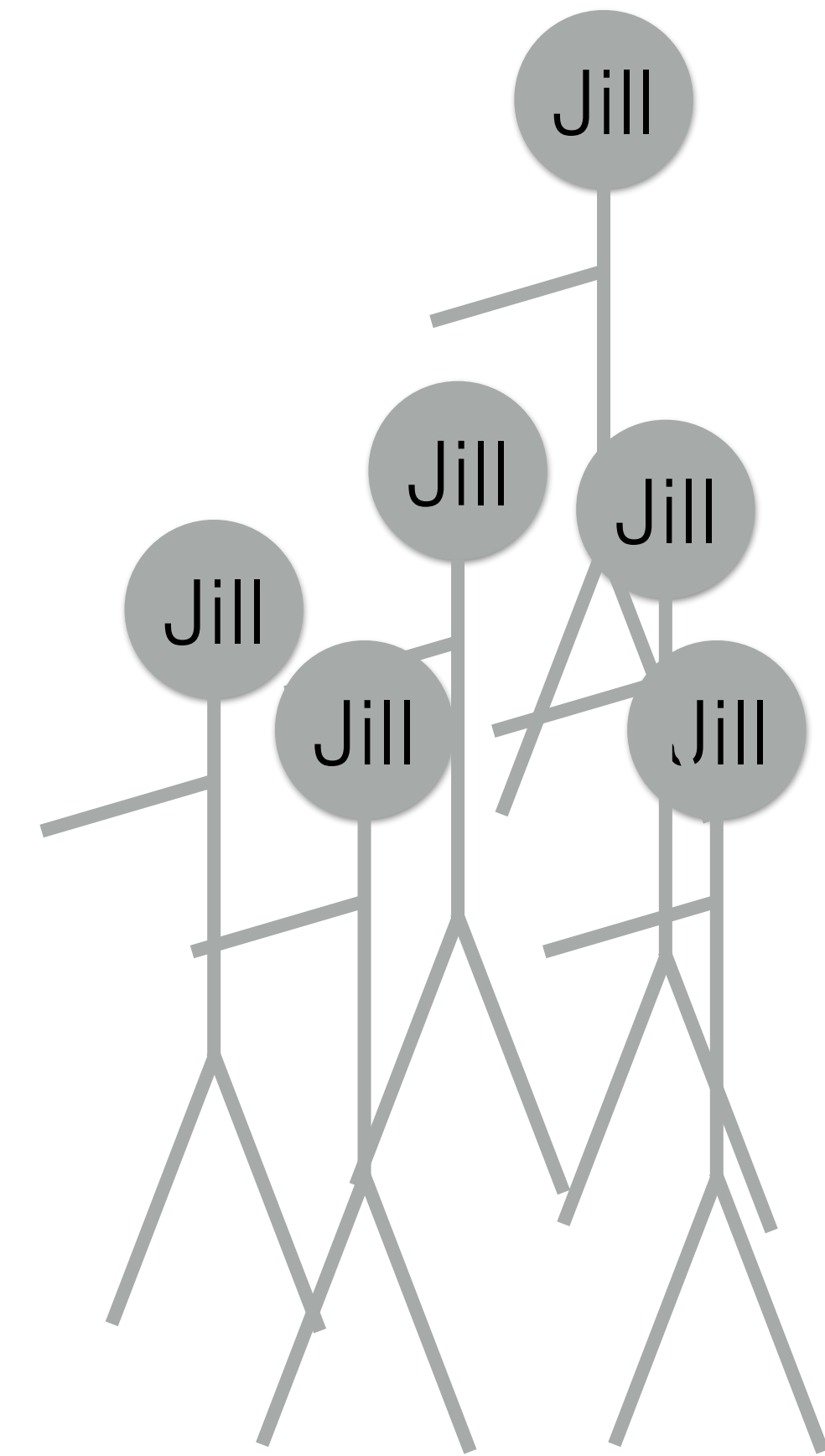


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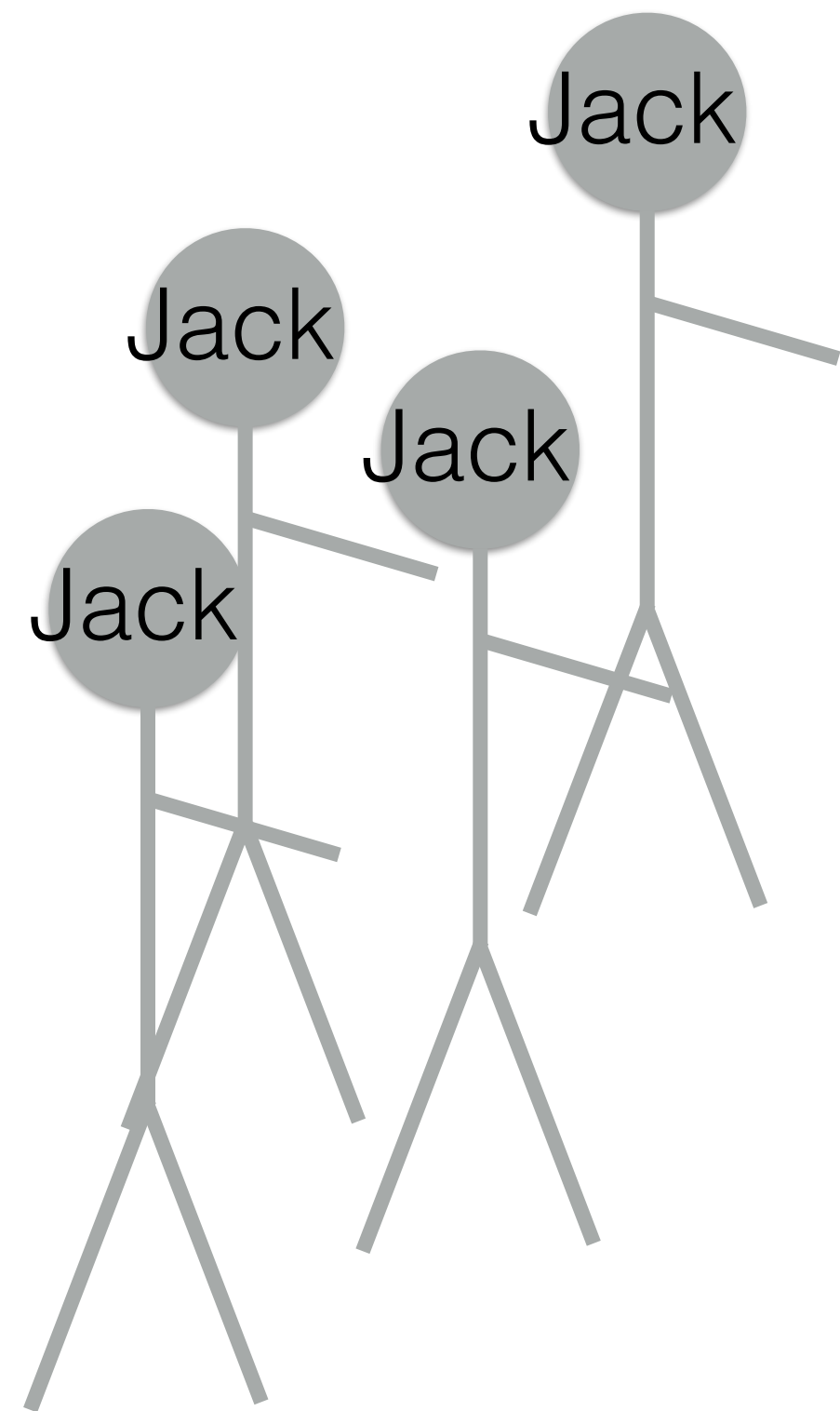
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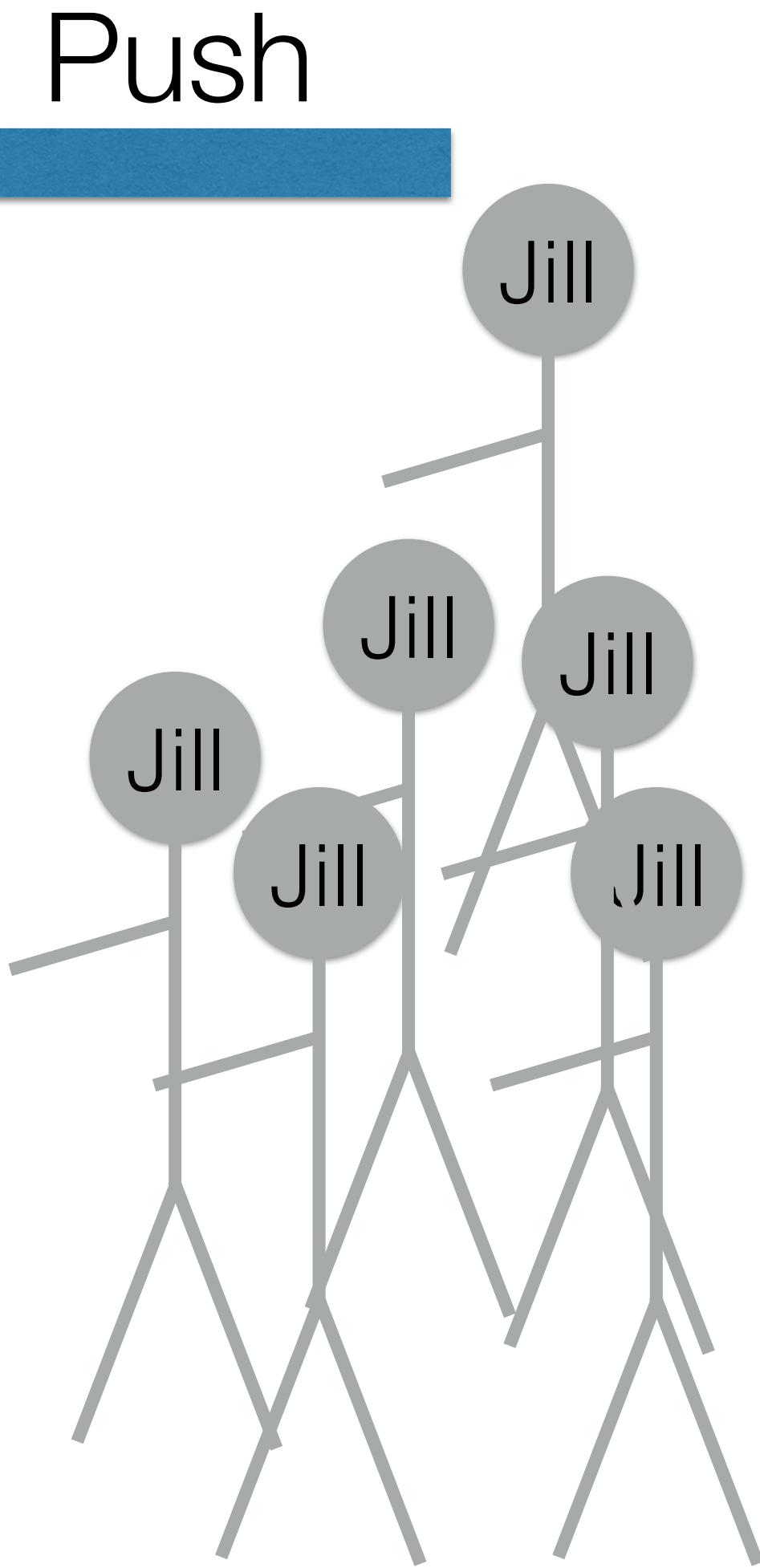
Motivation for URR: Gap analysis and prioritization

Linking Users to Knowledge

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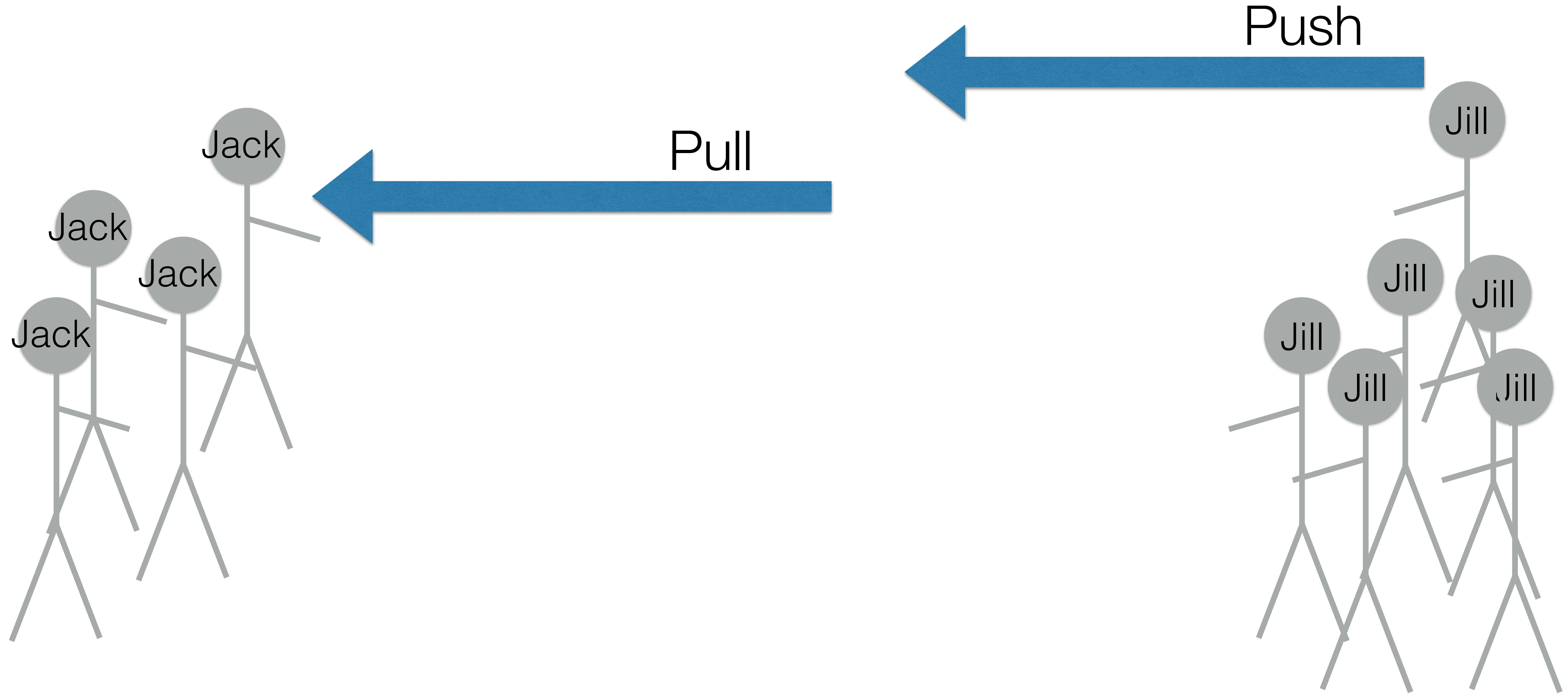


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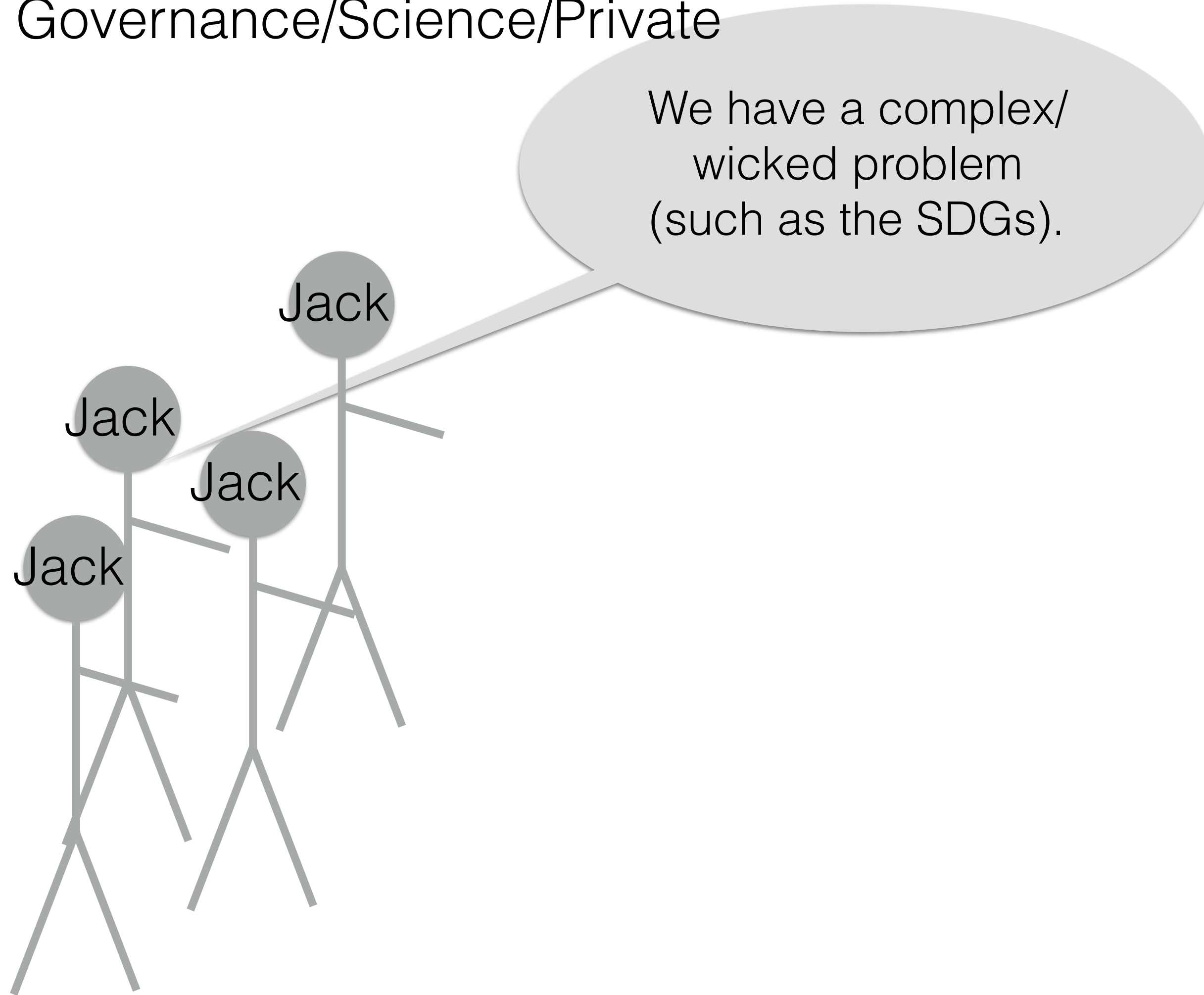
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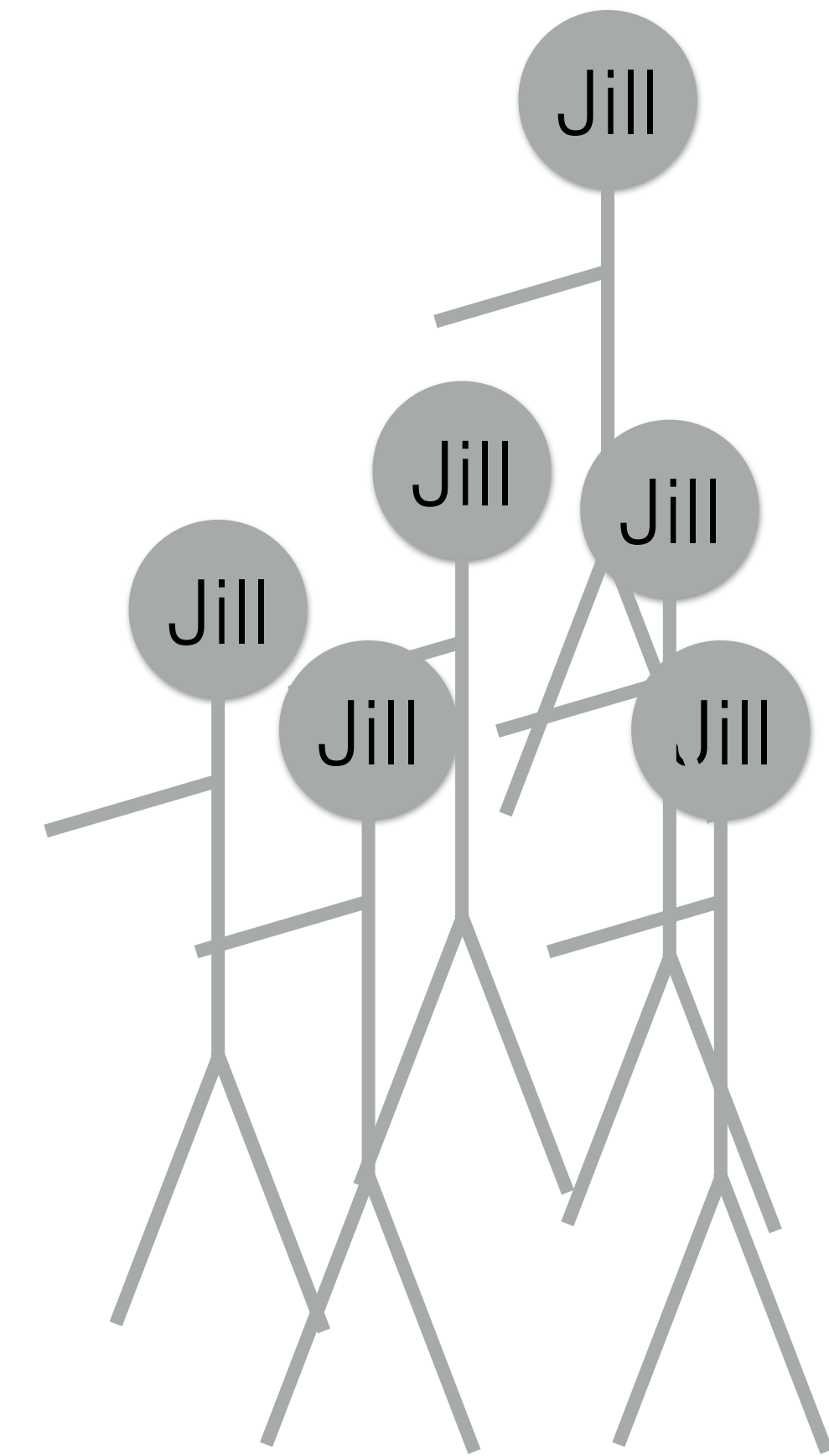
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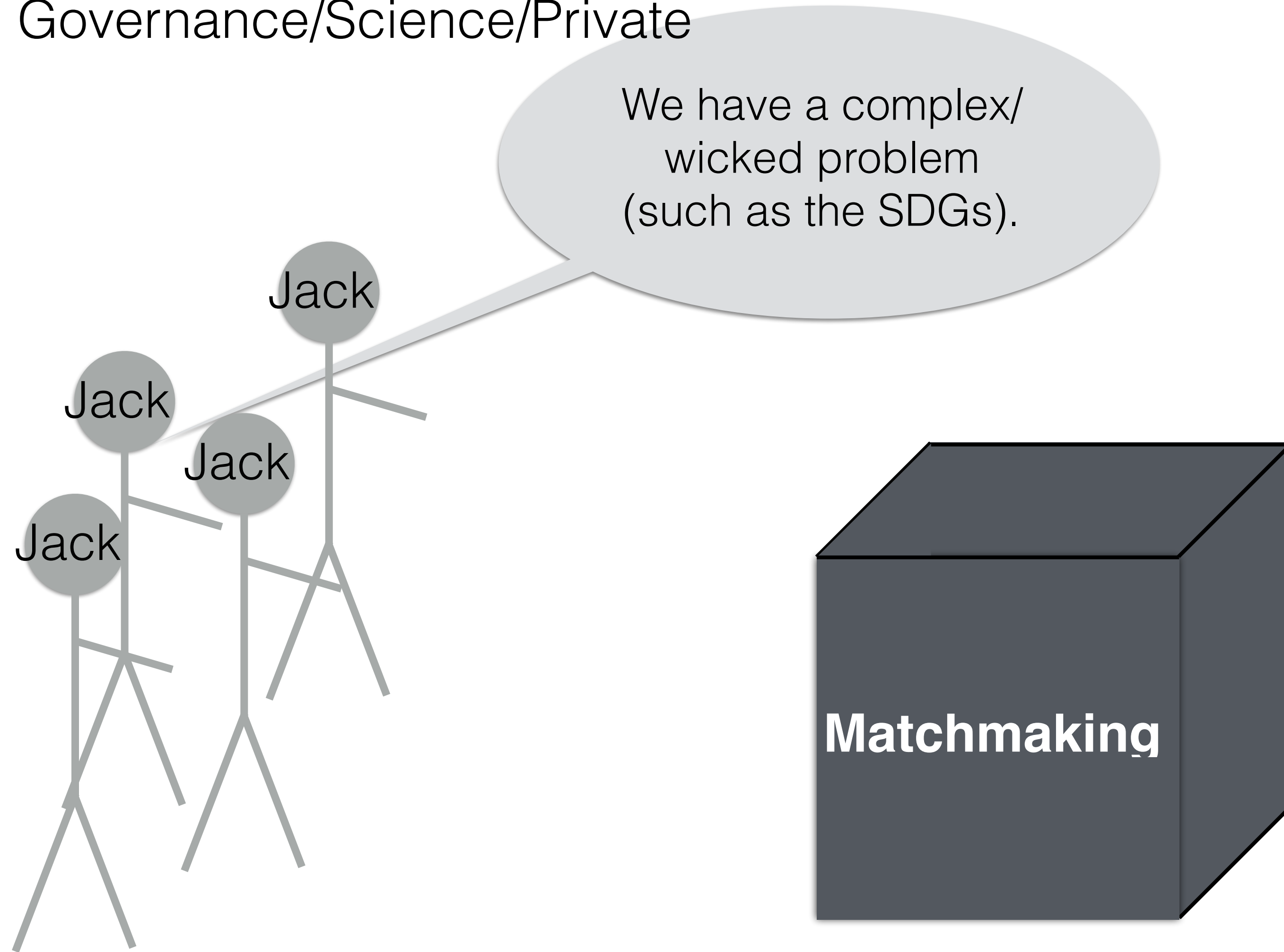
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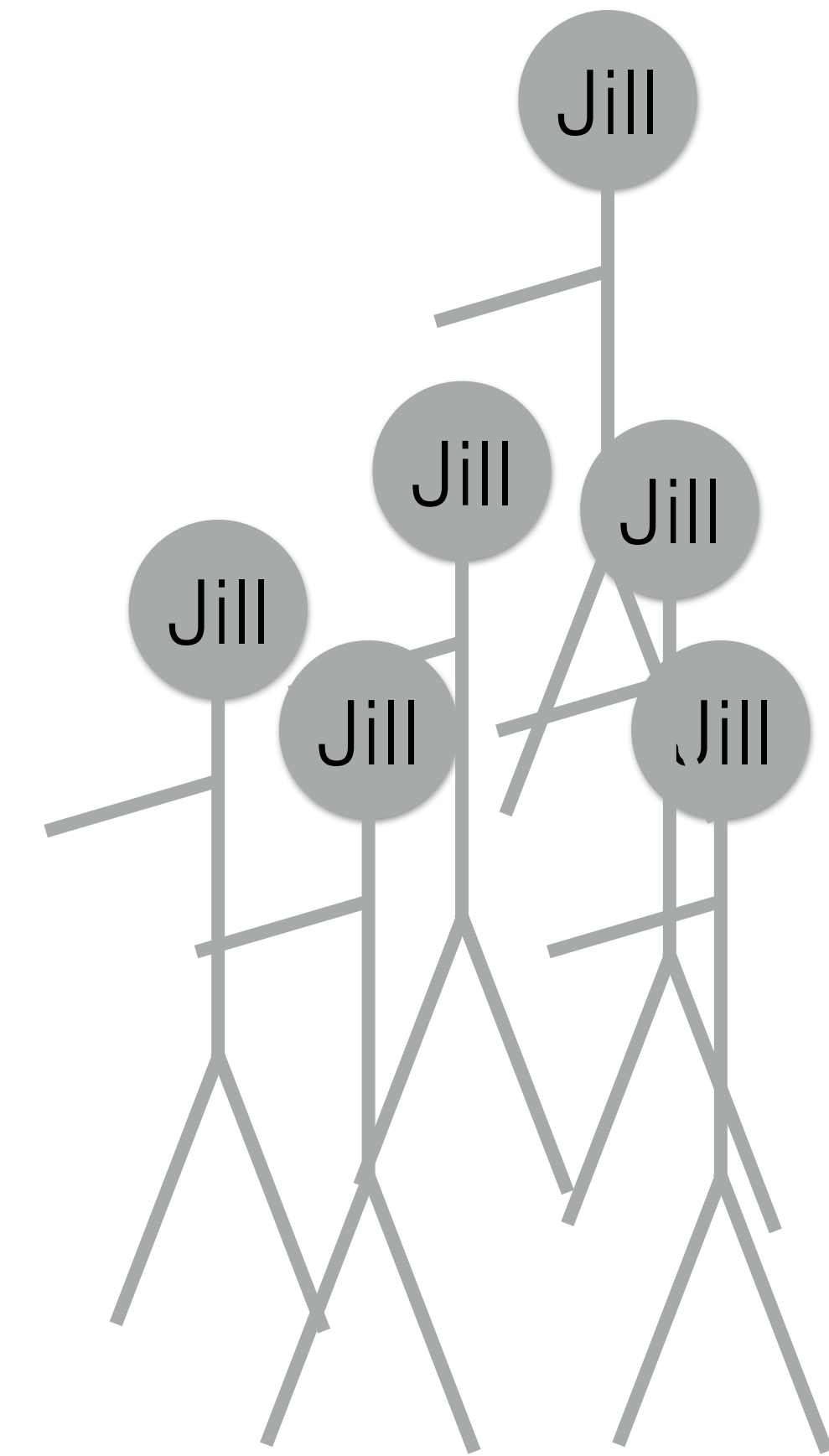
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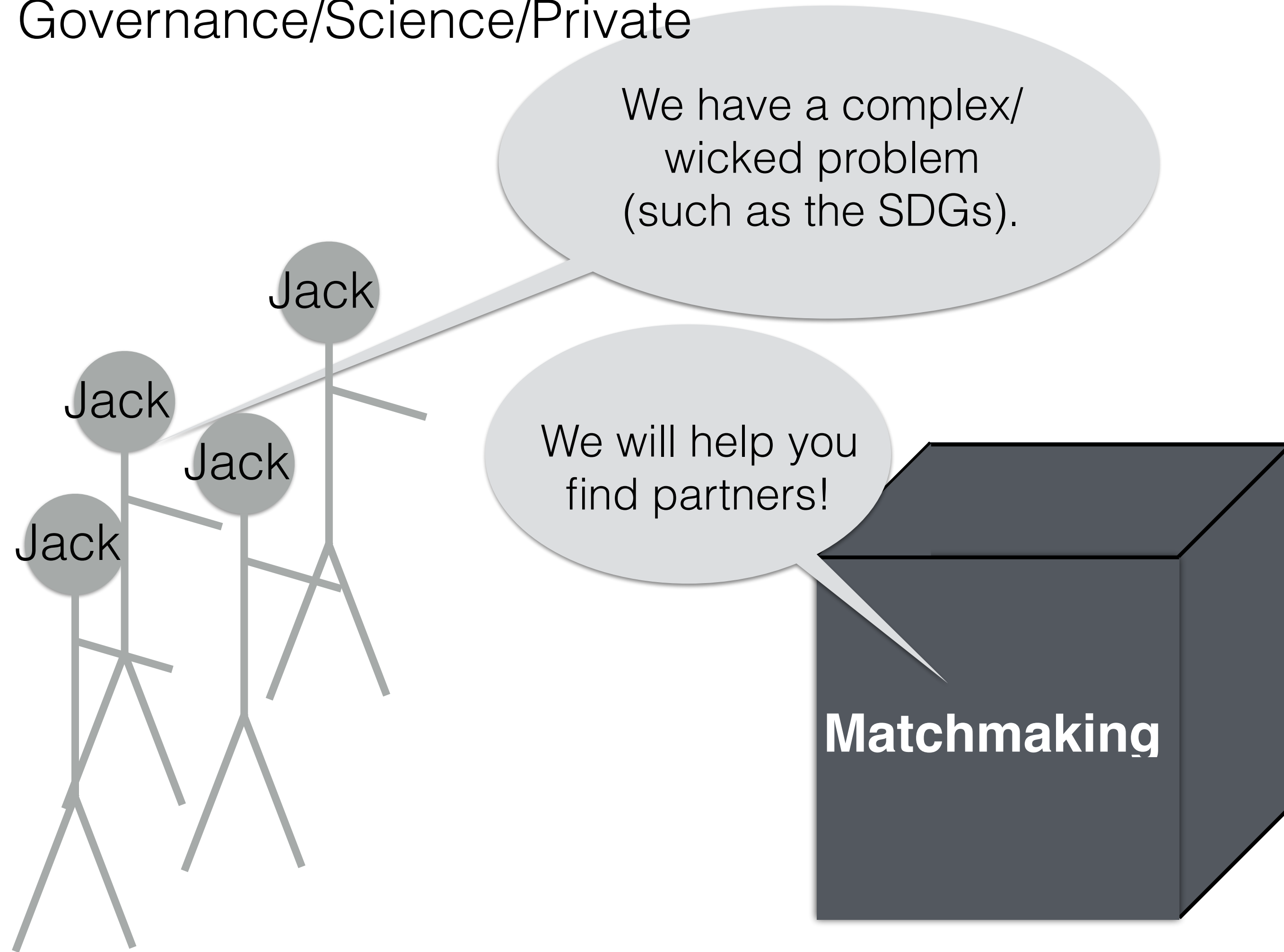
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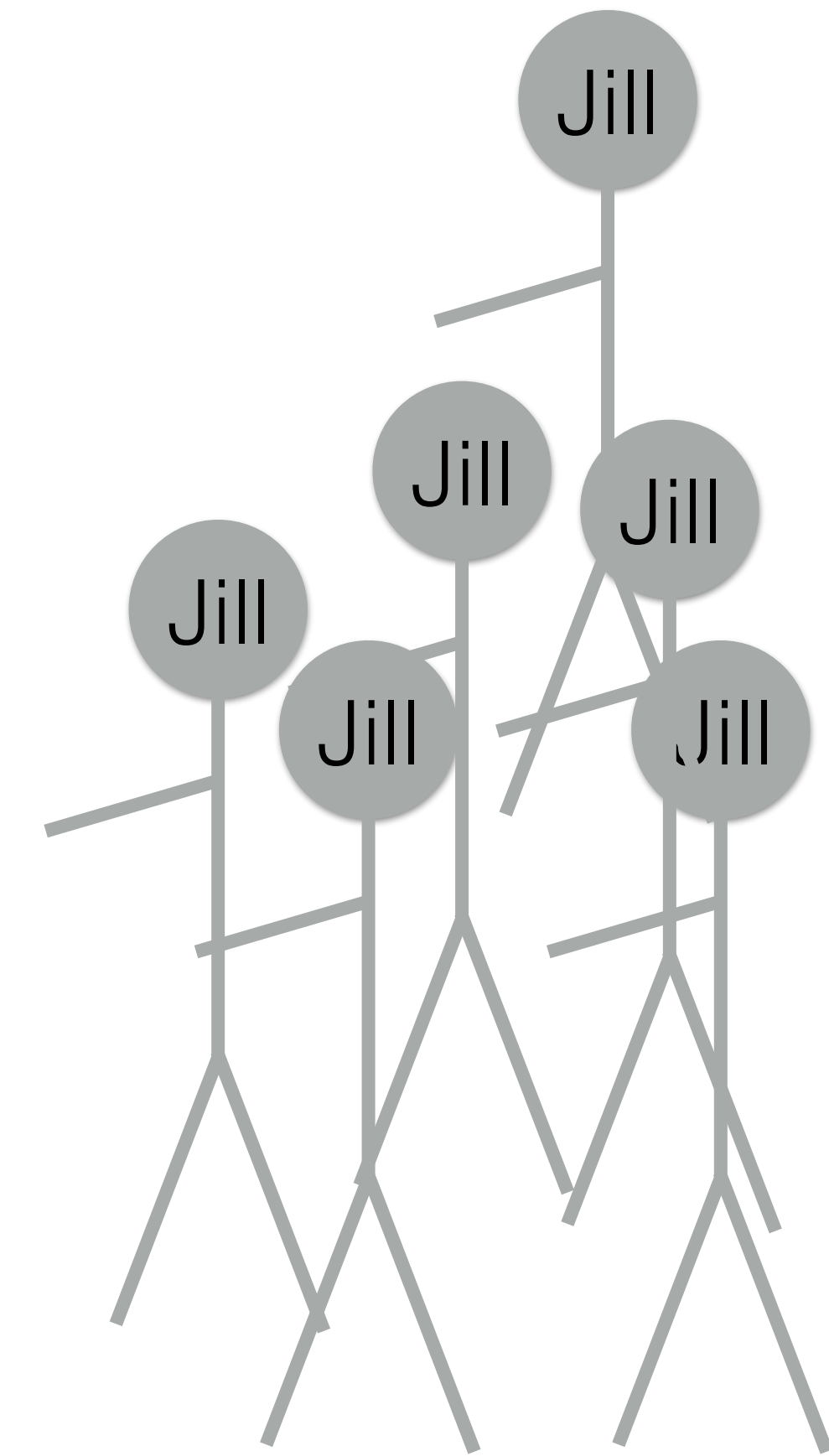
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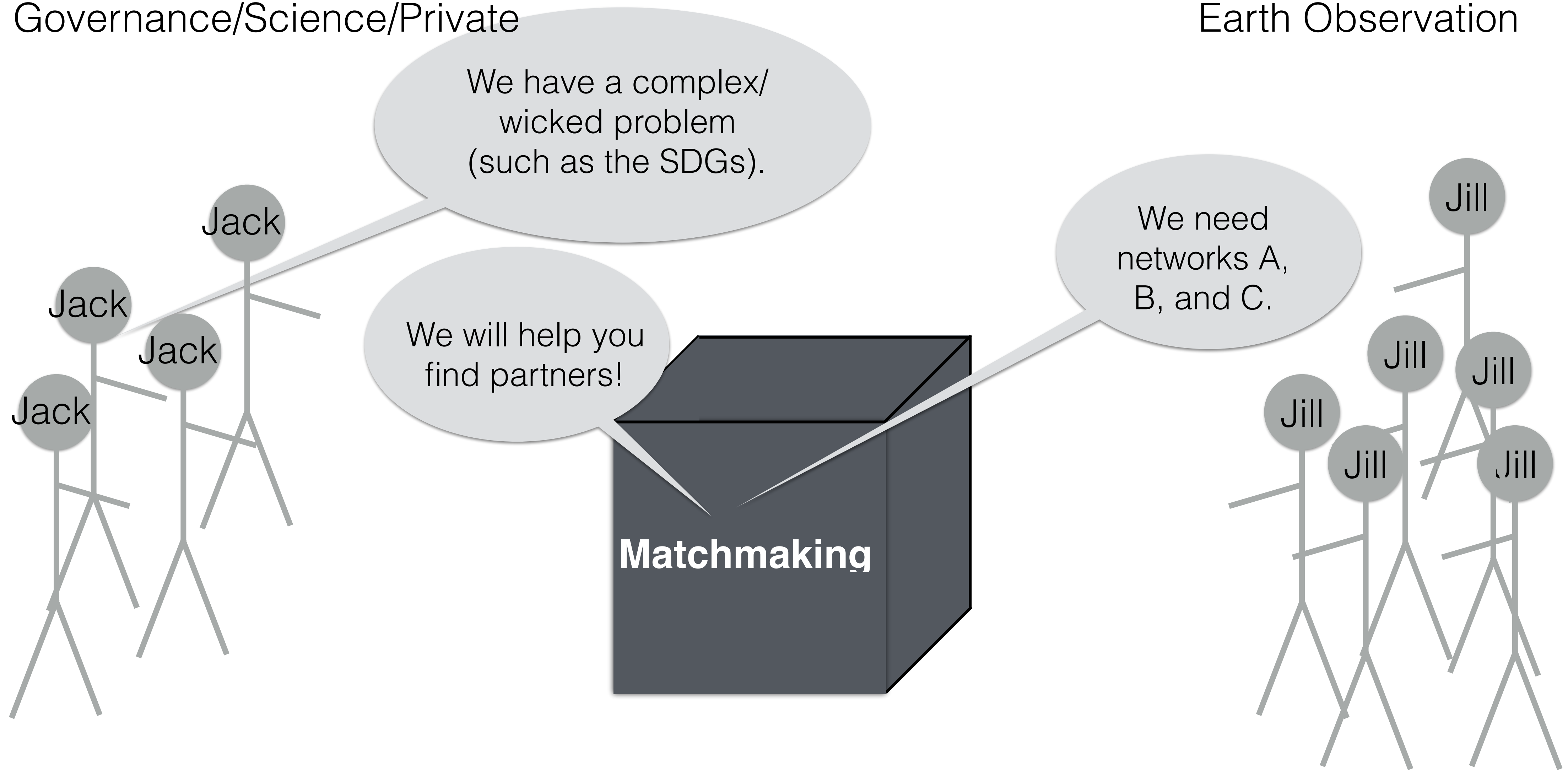


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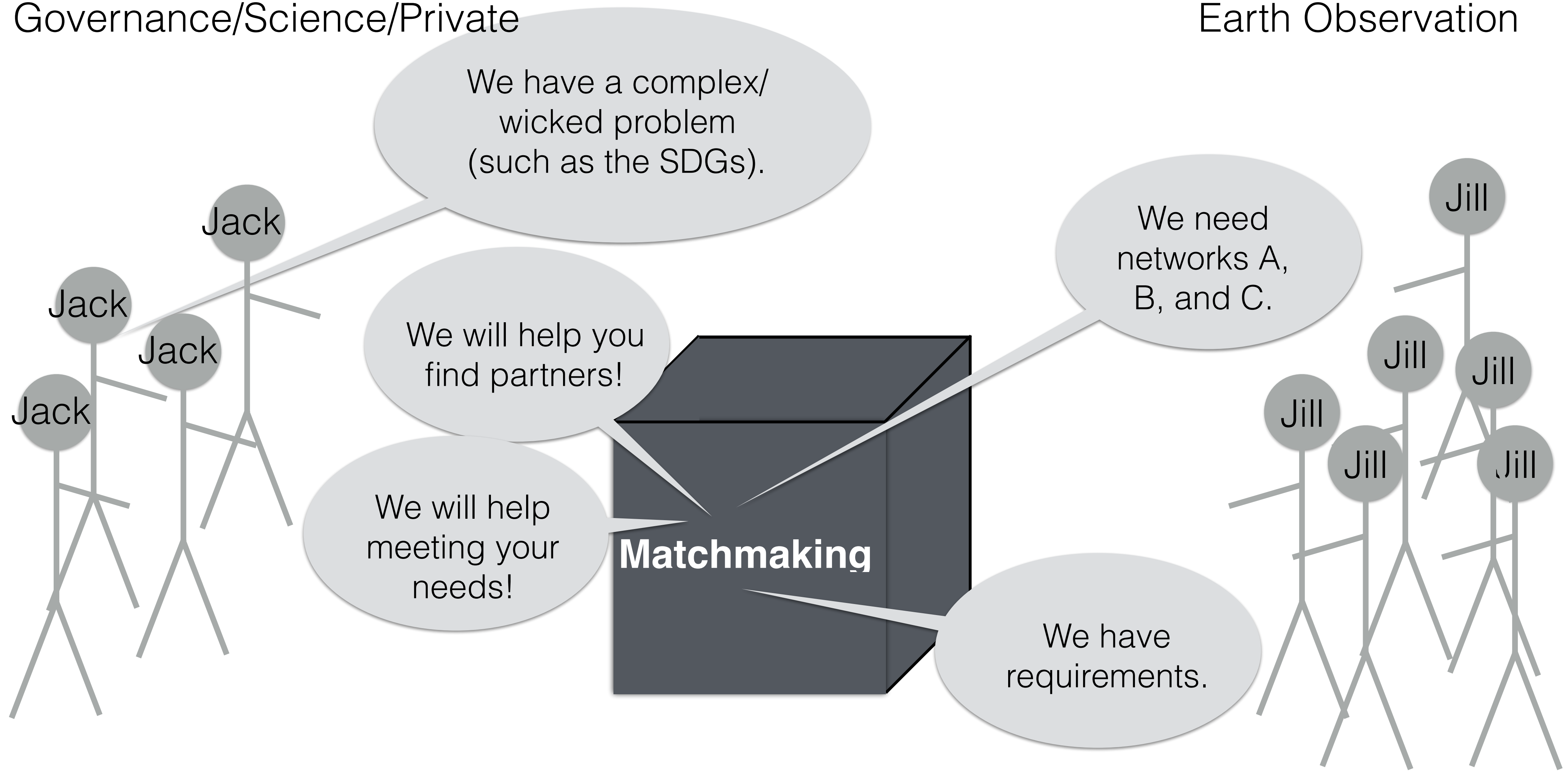


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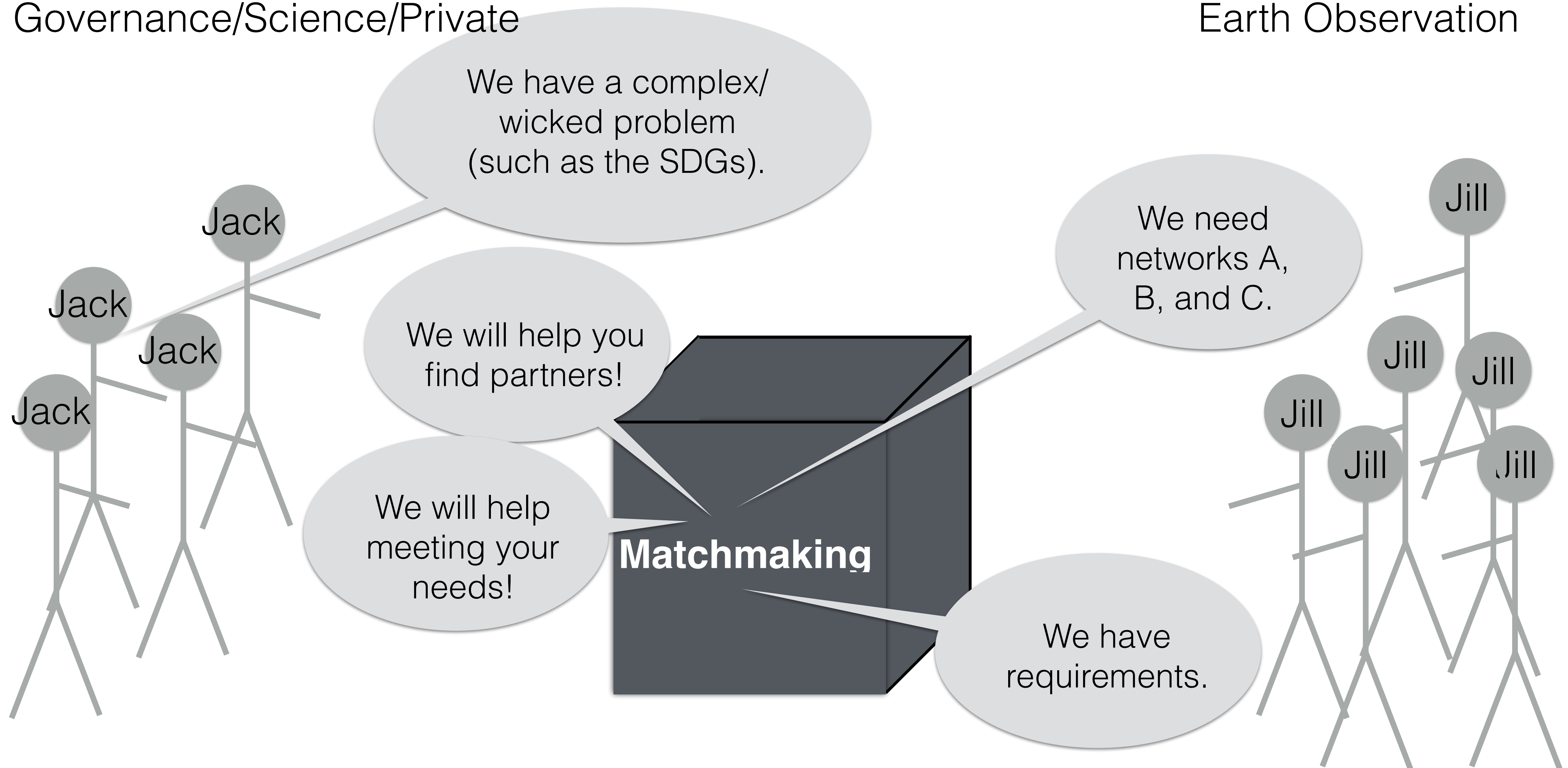


Motivation for URR: Gap analysis and prioritization

Linking Users to Knowledge

Governance/Science/Private

Earth Observation



New Motivation: Matchmaking (discover gaps on the go)

Motivation for URR: Gap analysis and prioritization

From Registries to Matching Platform

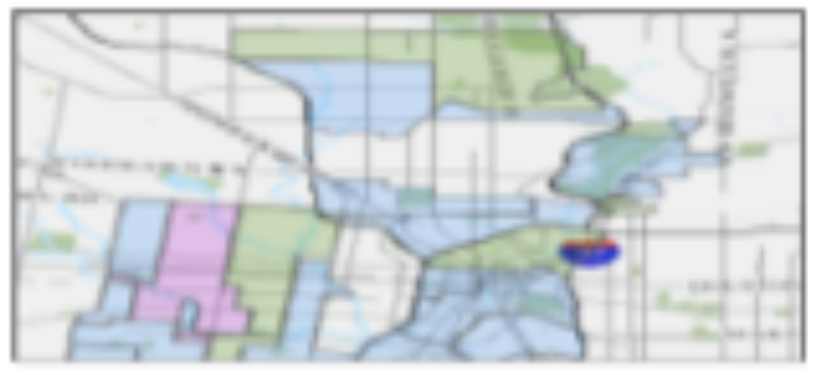
Polyglot Spatial Data in Data Repositories



"Points"



"Lines"



"Polygons"

Access Polyglot Data

Matching Users and Data

- represent data
- interact with users
- learn from graphs and feedback

promote, provide access

Users

Search, provide feedback

Access Graphs



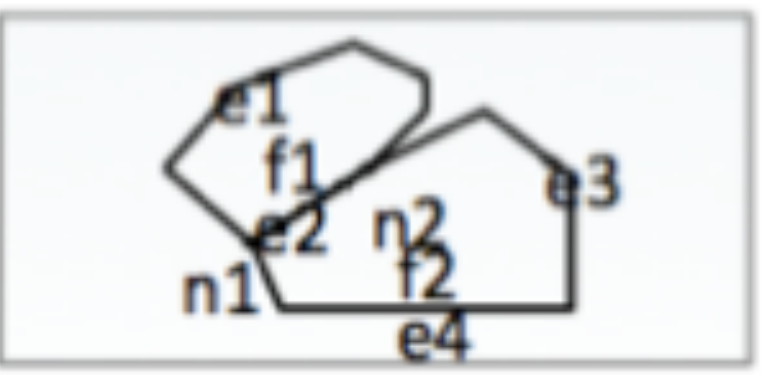
Property Graphs



Network Graphs



RDF Semantic Graphs



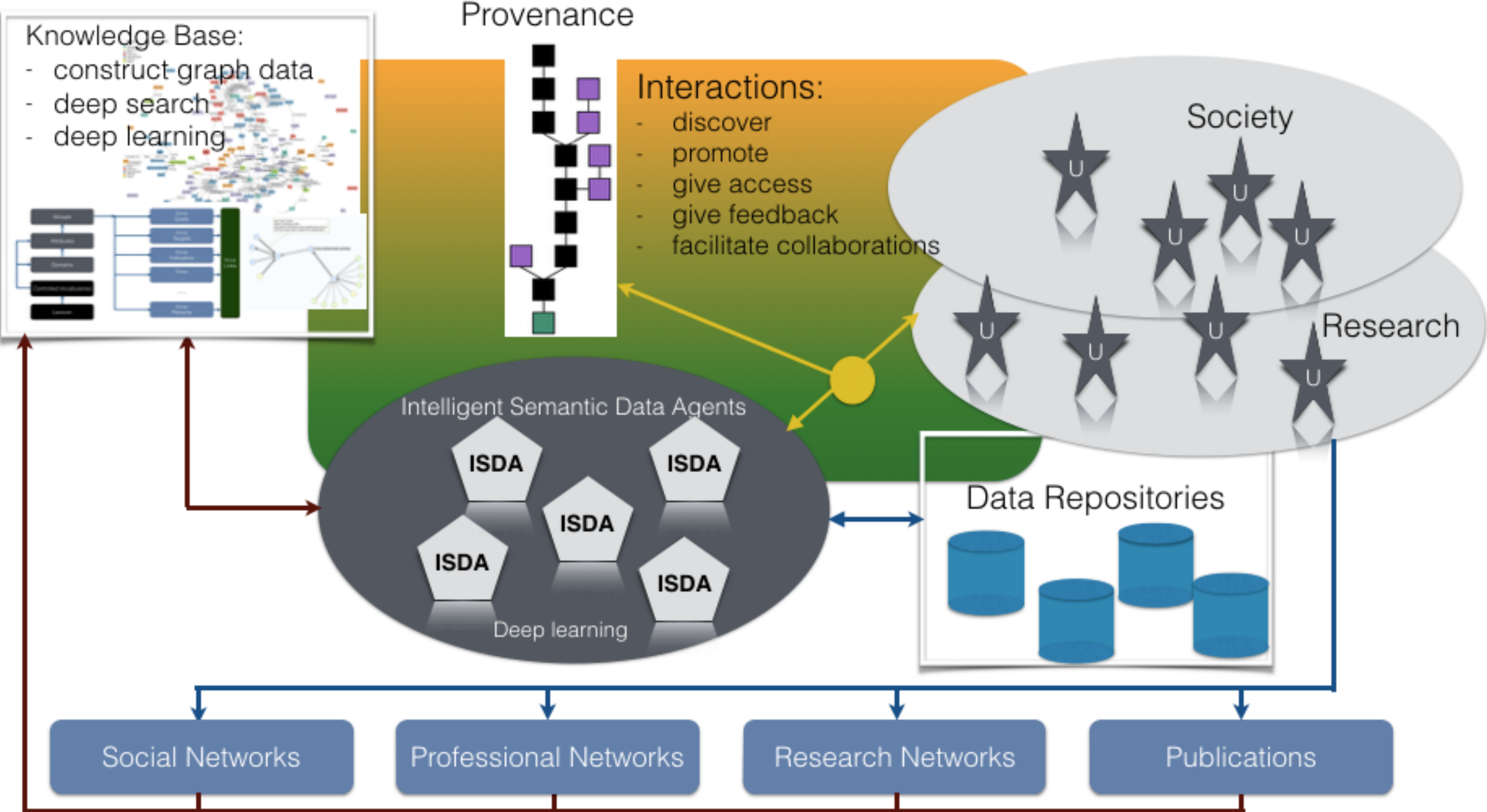
Topologies

Graph Data in Knowledge Base

From UDD to DDU

UDD: Users Discover Data

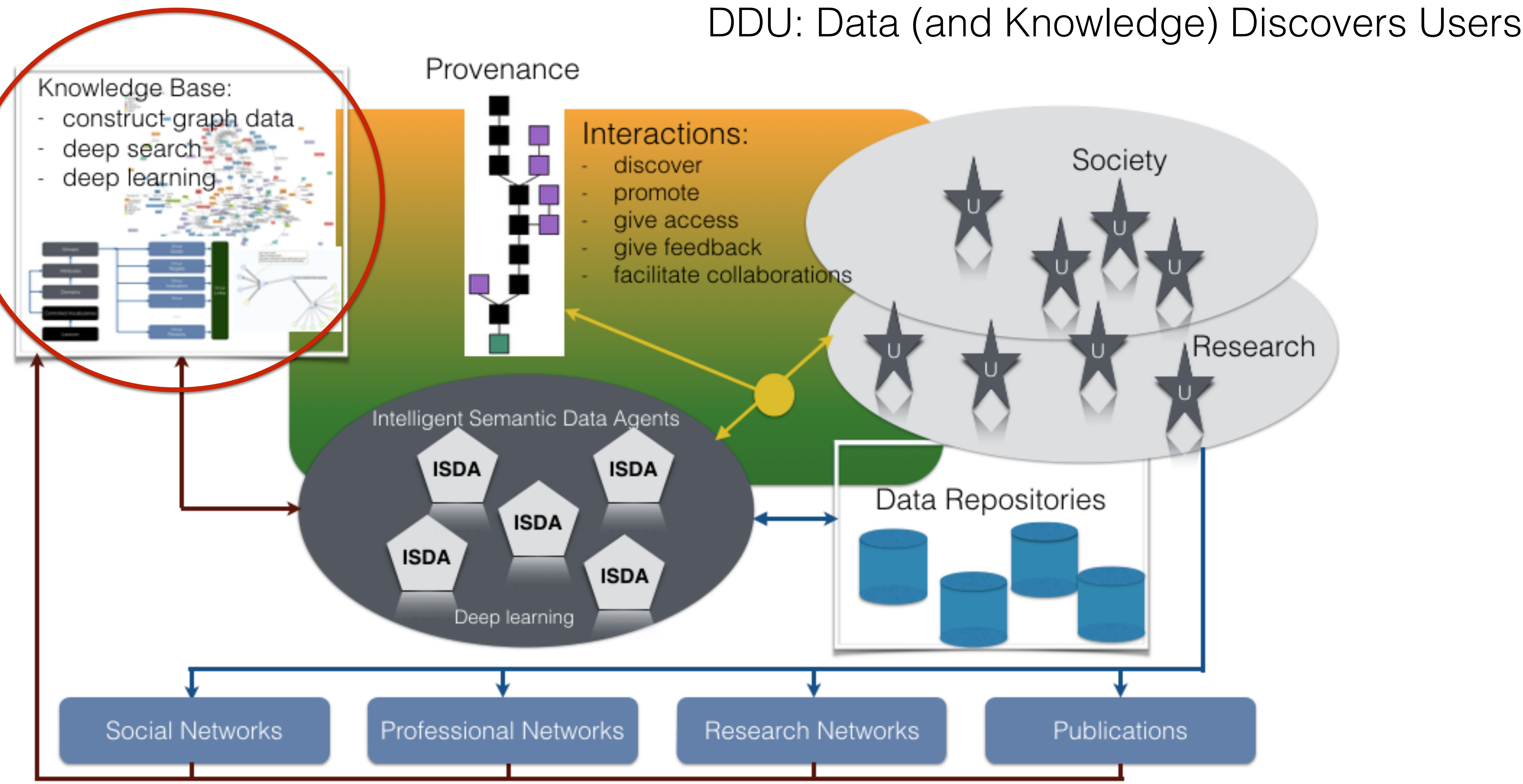
DDU: Data (and Knowledge) Discovers Users



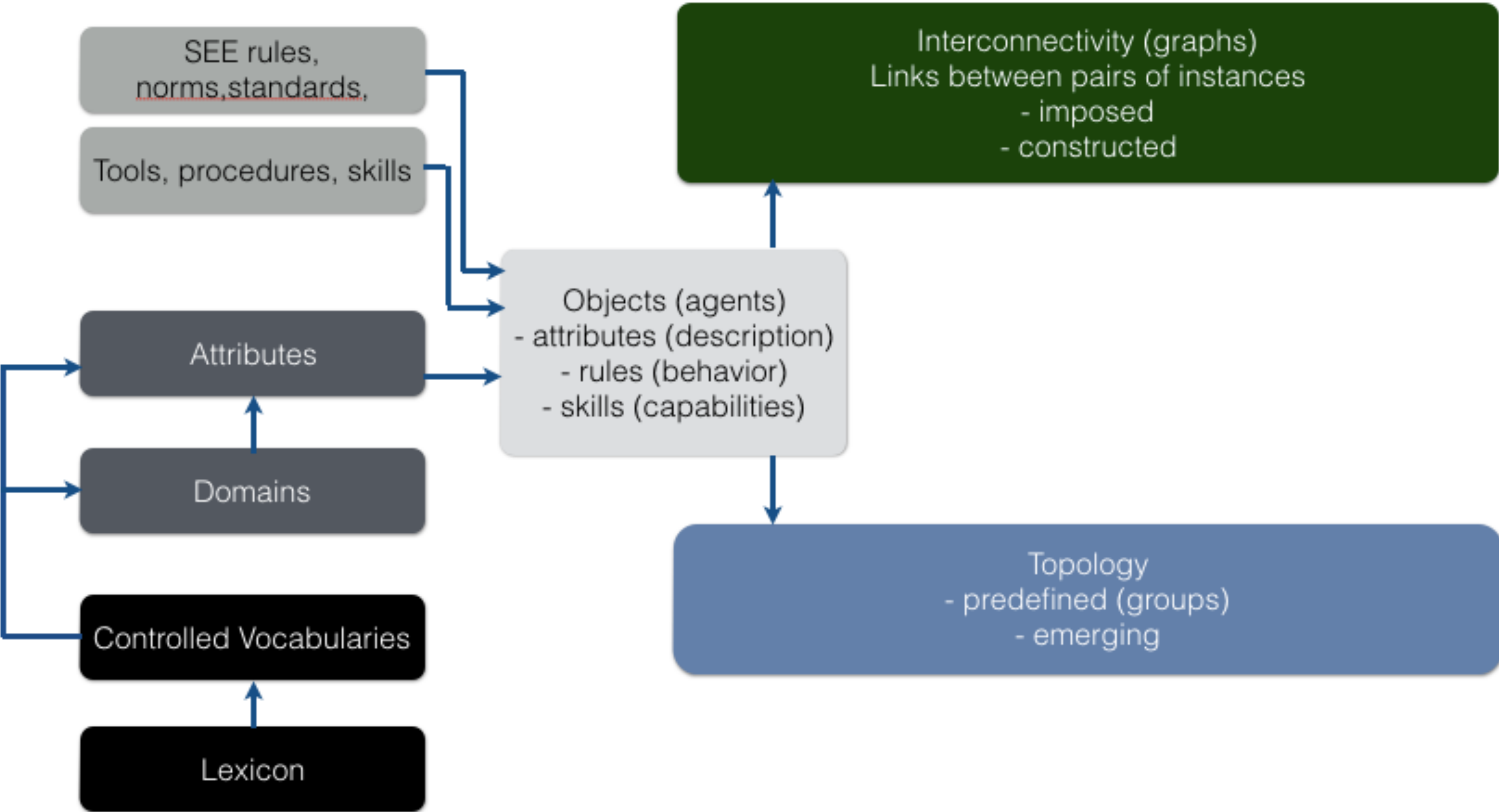
From UDD to DDU

UDD: Users Discover Data

DDU: Data (and Knowledge) Discovers Users



Representation





Knowing the Users and Meeting Their Information and Knowledge Needs

- Home
- Data Model
- Functionality
- Goal-Based Approach
- Gap Analysis
- Prioritization
- Virtual Stakeholder Table
- Related Projects

"We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely." E.O. Wilson

SEE-IN KB: A Collaborative Platform for Users and Providers

The best way to get to know users and to capture and understand societal information and knowledge needs is to "listen" to stakeholders engaged in addressing societal tasks and challenges. An understanding of how users make use of information derived from Earth observations and what type of information and knowledge they want, need and create can be developed by observing users while they access and use such observations and derived information. Therefore, the SEE-IN KB aims to become a collaborative platform where decision and policy makers can access and use Earth observations and derived information. By bringing the providers and users together on this collaborative platform, it will be possible to "learn" how decisions and policies are informed by Earth observations and derived information, how Earth observations and models are used to create practice-relevant knowledge, and where the gaps are that need to be addressed.

The design of such an collaborative platform that is of value and attractive for both users and providers and at the same time capable of learning from the activities of users and providers on this platform has to be innovative. Designing the platform is challenging. However, achieving the necessary revolution in how Earth observations are informing decision requires this innovation.

Functionality and Design of the initial version of the SEE-IN KB

A core function of the SEE-IN KB is to facilitate the linkage of societal goals and targets to Essential Variables (EVs). For each of the Sustainable Development Goals (SDGs), a set of Targets have been established. These targets are connected to indicators. The indicators are report cards for the progress towards the targets and they are a planning tool for measures to achieve the targets. The associated EVs need to be

The SEE-IN KB: A Core Element of the GEOSS KB

The SEE-IN KB replaces the GEOSS User Requirements Registry (URR). Of particular interest are those information needs that are linked to indicators defining the monitoring framework for the Sustainable Development Goals (SDGs). The SEE-IN KB uses a goal-based approach for the identification of Essential Variables (EVs). Specifically, this approach is used to identify those variables that are essential for the quantification of SDG indicators. The approach aims to be consistent with the UN's System of Environmental-Economic Accounting (SEEA). The SEE-IN KB will include rules to define the observation needs for these EVs and the SDG indicators. A first operational version of the SEE-IN KB is expected to be available on-line in October 2016.

Background

The Global Earth Observing System of Systems (GEOSS) is envisioned as a system of systems that integrates environmental and socio-economic data with models to meet the information needs of societal decision makers. The GEOSS User Requirements Registry (URR) had the goal to inform GEOSS about the information needs of societal stakeholders.

At the Ministerial Summit on Earth Observations held in January 2014, the Ministers asked the Group on Earth Observations (GEO) to focus on five priority activities, of which one was: "Develop a comprehensive interdisciplinary knowledge base defining and documenting observations needed for all disciplines and facilitate availability and accessibility of these observations to user communities." In response to this guidance, GEO included the Foundational Task GD-09 "Knowledge Base Development" in the 2016 GEO Work Programme. The key objective of GD-09 is to develop a comprehensive interdisciplinary GEOSS KB defining and documenting observations needed for all disciplines. This will allow the sharing of not just data but also of how these data can be used to address key policy or scientific questions, and link also to the community of users addressing

Knowing the Users and Meeting Their Information and Knowledge Needs

- Home
- Data Model
- Functionality
- Goal-Based Approach
- Gap Analysis
- Prioritization
- Virtual Stakeholder Table
- Related Projects

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SEE-IN KB: A Collaborative Platform for Users and Providers **The SEE-IN KB: A Core Element of the GEOSS KB**

Publish: harvest, upload, crowd-sourcing, big data, feedback
Search: View contents, search, export, graphs, feedback
Analyze: matchmaking (analyze graphs), gaps, prioritize, feedback
Network: data, models, people, problems, goals, part and functions of planet
Make decision: workspace for decisions informed by Eos
Tools: toolbar to exchange a wide range of tools, practices, work flows.

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- ### SEE-IN KB Development:
- Open Source
 - Community-Based
 - Merge with others?
 - Private Business?

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