Stakeholder Value Network Analysis for Large Oil and Gas Projects

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OUTLINE

☐ Introduction/Motivation

☐ Methodology/Case Study

☐ Conclusions

Introduction

☐ **Who are stakeholders?**

- A stakeholder in an organization (corporation, government, project, etc.) is "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984).

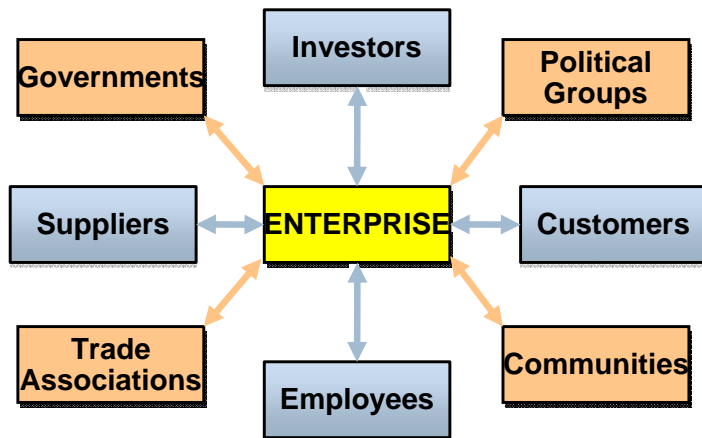☐ **Why we care about stakeholders?**

- In order to ensure the organization's "long-term success" (Freeman and McVea, 2001; Moses, 2004; Mostashari and Sussman, 2005; Crawley, 2006).

☐ **What's the limitation of current stakeholder models?**

- Only examine the direct relationships between the focal organization and its stakeholders, like "hub-and-spoke", ignoring their indirect relationships and the interactions between stakeholders on the network level (Rowley, 1997; Mahon et al., 2003; Lucea, 2007).
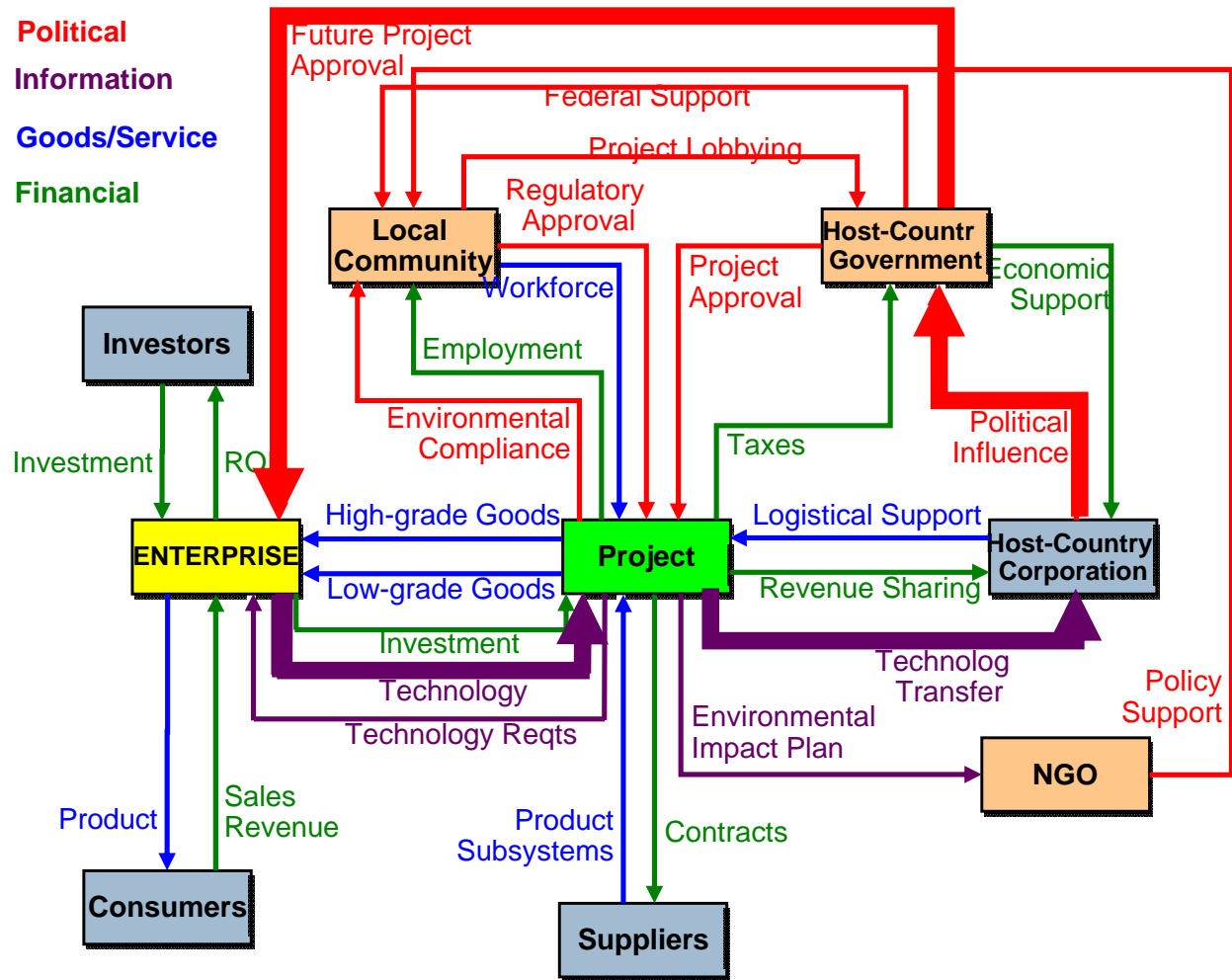
Introduction: "Hub-and-Spoke" Model and Value Network

Legend:
- Market Stakeholders
- Nonmarket Stakeholders
- The Focal Organization

Flow types:
- Political
- Information
- Goods/Service
- Financial

"Hub-and-Spoke" Stakeholder Model
(Adapted from Donaldson and Preston, 1995)

Hub-and-Spoke model nodes: Governments, Investors, Political Groups, Suppliers, ENTERPRISE, Customers, Trade Associations, Employees, Communities

Value Network nodes and flows: Investors, Local Community, Host-Country Government, ENTERPRISE, Project, Host-Country Corporation, Consumers, Suppliers, NGO

Flows: Future Project Approval, Federal Support, Project Lobbying, Regulatory Approval, Project Approval, Economic Support, Environmental Compliance, Workforce, Employment, Project Approval, Political Influence, Investment, ROI, High-grade Goods, Low-grade Goods, Logistical Support, Taxes, Revenue Sharing, Investment, Technology, Technology Reqts, Technology Transfer, Environmental Impact Plan, Policy Support, Product, Sales Revenue, Product Subsystems, Contracts

Stakeholder Value Network
(Feng, Cameron, and Crawley, 2008)

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Motivation

- **Indirect Relationships:**
    - Understand the impact of both direct and indirect relationships between stakeholders on the success of large oil and gas projects.
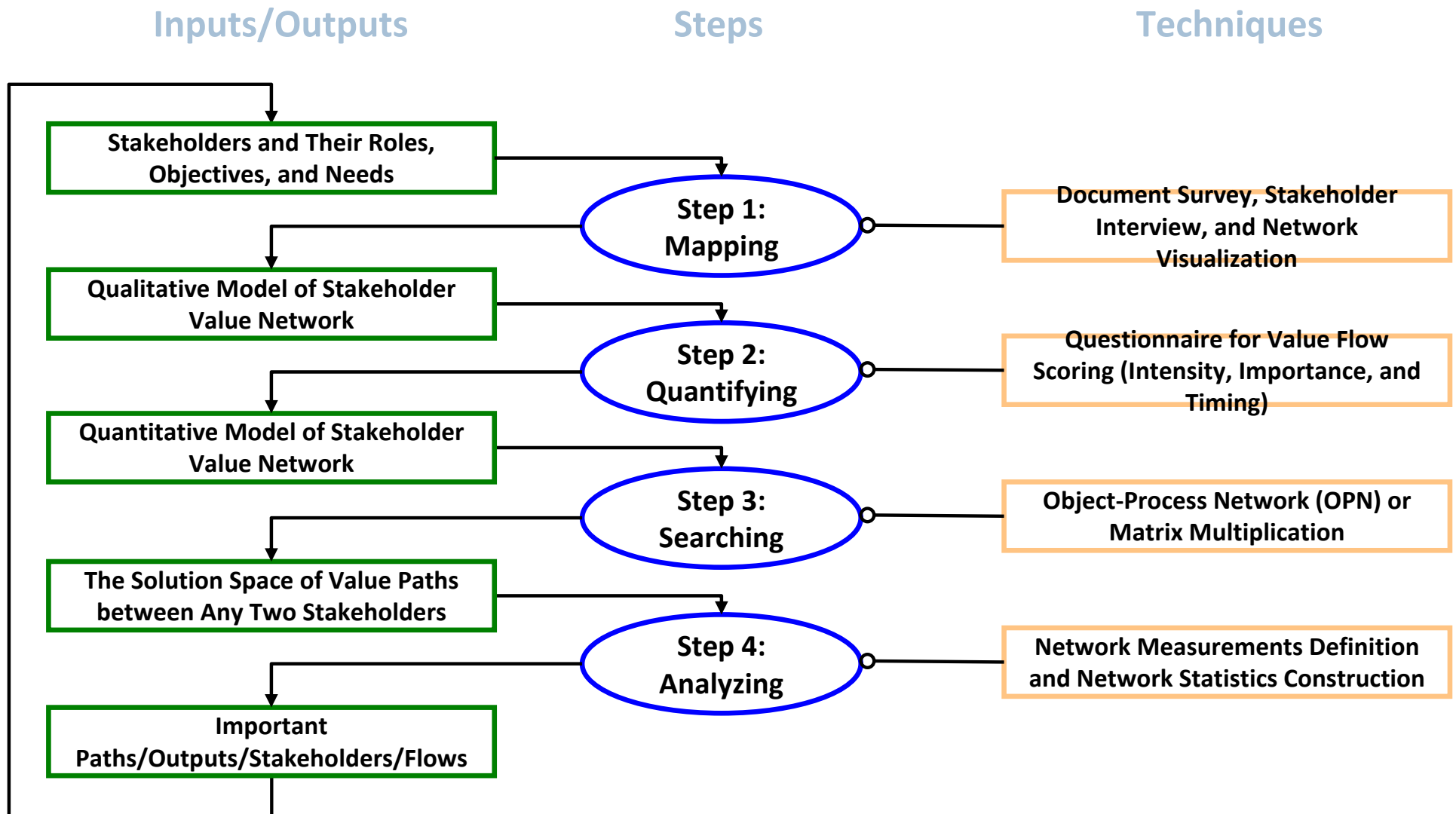
- **Strategies with Reduced Complexity:**
    - Apply such an understanding to inform decisions on stakeholder management strategies in a positive way and with reduced complexity.
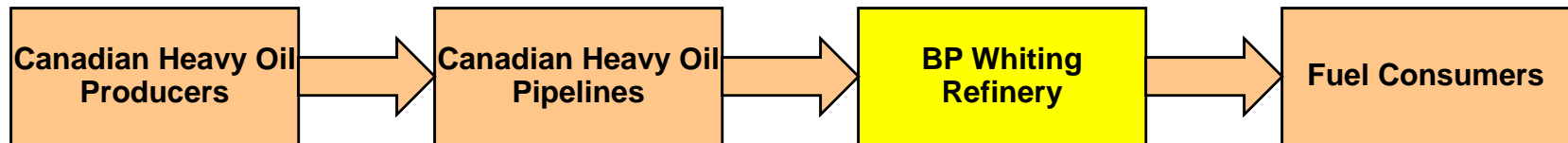
- **Communication Platform:**
    - Build a common platform for engineering, external affairs, commercial, and management within a project to communicate important information about stakeholders.
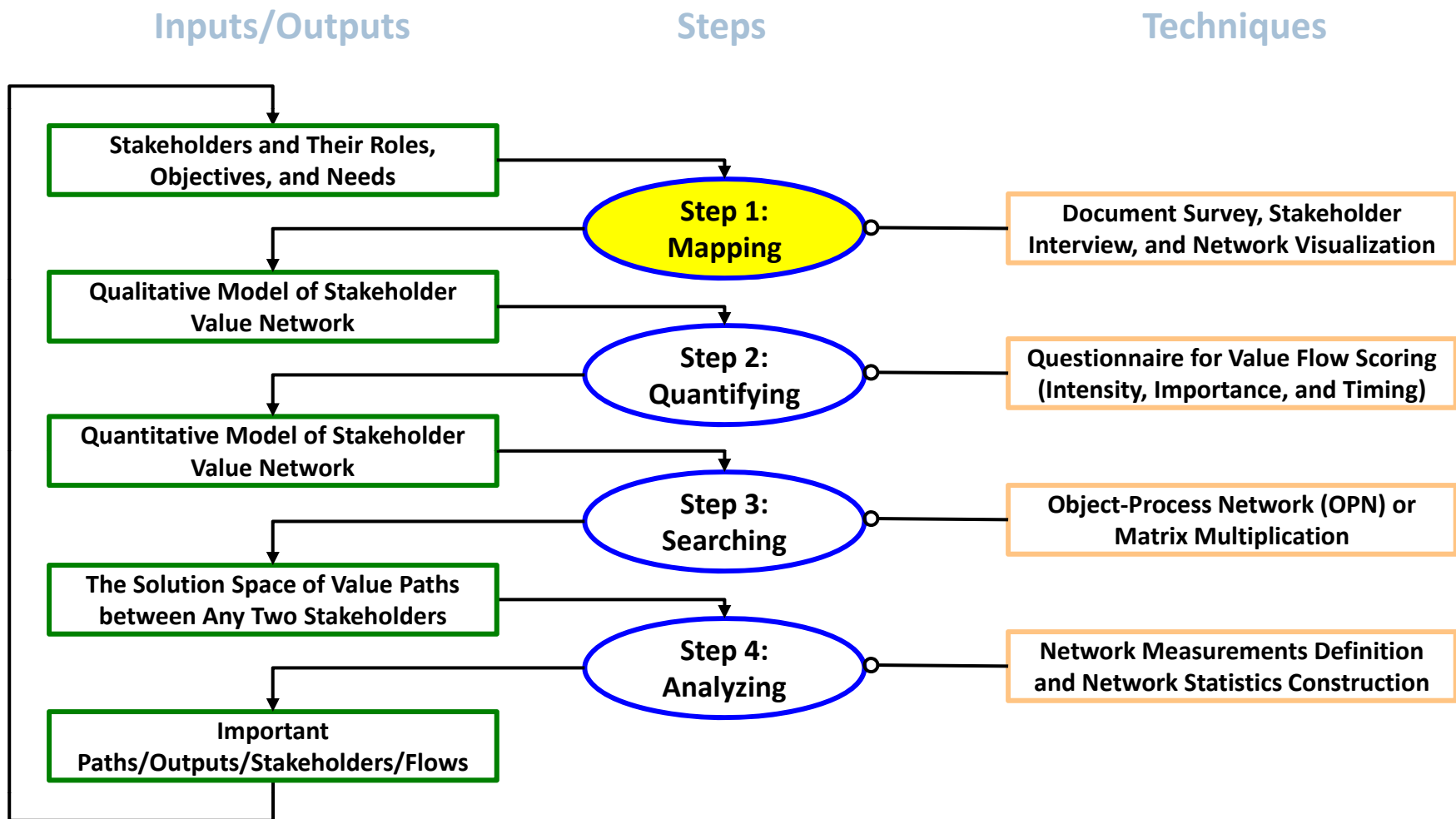
Methodology

Inputs/Outputs	Steps	Techniques

Stakeholders and Their Roles, Objectives, and Needs

Step 1: Mapping

Document Survey, Stakeholder Interview, and Network Visualization

Qualitative Model of Stakeholder Value Network

Step 2: Quantifying

Questionnaire for Value Flow Scoring (Intensity, Importance, and Timing)

Quantitative Model of Stakeholder Value Network

Step 3: Searching

Object-Process Network (OPN) or Matrix Multiplication

The Solution Space of Value Paths between Any Two Stakeholders

Step 4: Analyzing

Network Measurements Definition and Network Statistics Construction

Important Paths/Outputs/Stakeholders/Flows

Case Study

Canadian Heavy Oil Producers	→	Canadian Heavy Oil Pipelines	→	BP Whiting Refinery	→	Fuel Consumers

- **BP Whiting Refinery Modernization Project**

  - *Whiting Refinery: located in northwest Indiana, with more than 100-year history;*

  - *Modernization Project: 2007-2012, $3.8 billion, + 1.7-million-gallon gasoline/day;*

  - *Stakeholder Support: new water permits for increased discharge of ammonia and suspended solids, issued by Indiana Department of Environmental Management (IDEM) and EPA;*

  - *Stakeholder Opposition: an **unanticipated** firestorm of protest from Public Media (Chicago Tribune, Chicago Sun-Times, etc.) and Local Public (in Illinois), concerning water permitting;*

  - *BP finally promised to keep the lower discharge limits and could be forced to cancel the project;*

  - *Managers' Mental Model for Stakeholder Importance: Indiana State Government (IDEM) and U.S. Federal Government (EPA) are the most important stakeholders.*
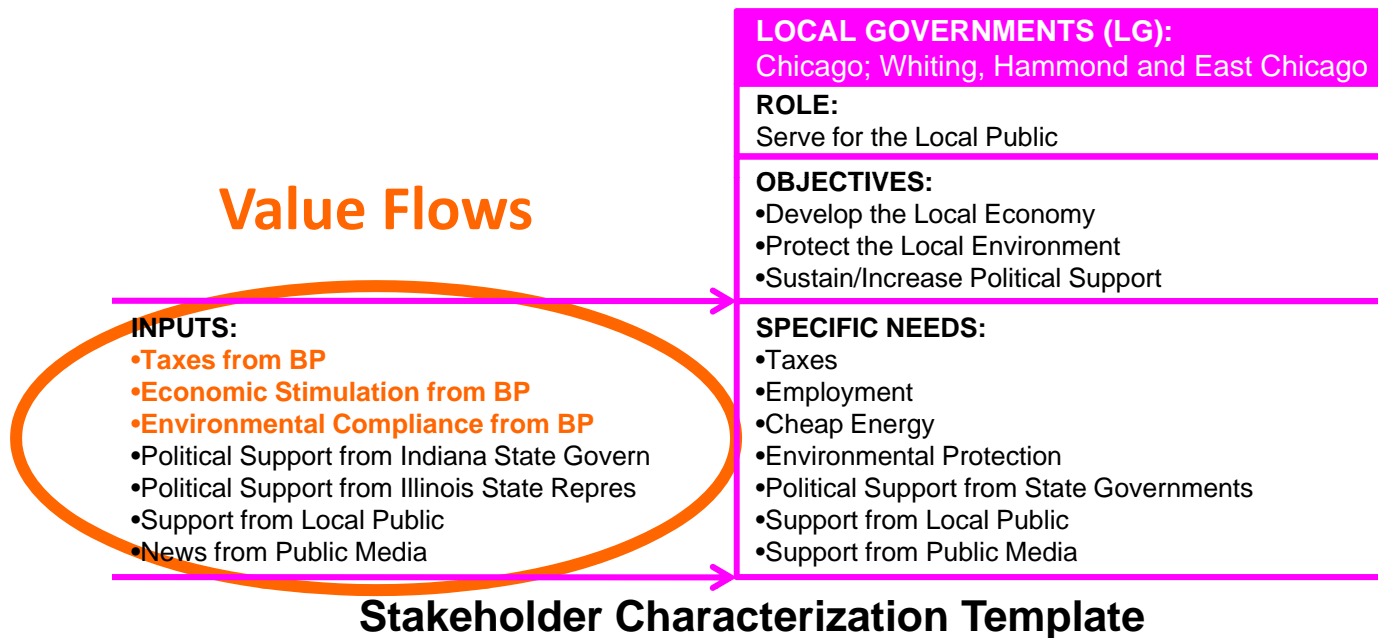
BP Whiting Case: Step 1 – Mapping

Inputs/Outputs

Steps

Techniques

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Stakeholders and Their Roles, Objectives, and Needs

- **Stakeholder Identification**
  - *Environment: Market and Nonmarket;*
  - *Attribute: Power, Legitimacy, and Urgency (Mitchell et al., 1997);*
  - *Clustering: Aggregation (by role/function) and Hierarchy (by jurisdiction/control).*

- **Value Flow Definition**

Value Flows

LOCAL GOVERNMENTS (LG): Chicago; Whiting, Hammond and East Chicago
ROLE: Serve for the Local Public
OBJECTIVES: •Develop the Local Economy •Protect the Local Environment •Sustain/Increase Political Support
SPECIFIC NEEDS: •Taxes •Employment •Cheap Energy •Environmental Protection •Political Support from State Governments •Support from Local Public •Support from Public Media

INPUTS:
- **Taxes from BP**
- **Economic Stimulation from BP**
- **Environmental Compliance from BP**
- Political Support from Indiana State Govern
- Political Support from Illinois State Repres
- Support from Local Public
- News from Public Media

Stakeholder Characterization Template

3

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BP Whiting Case: Step 2 – Quantifying

Inputs/Outputs   **Steps**   **Techniques**

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Important Paths/Outputs/Stakeholders/Flows

Ranked by the stakeholders receiving these value flows or Ranked from their own standpoint

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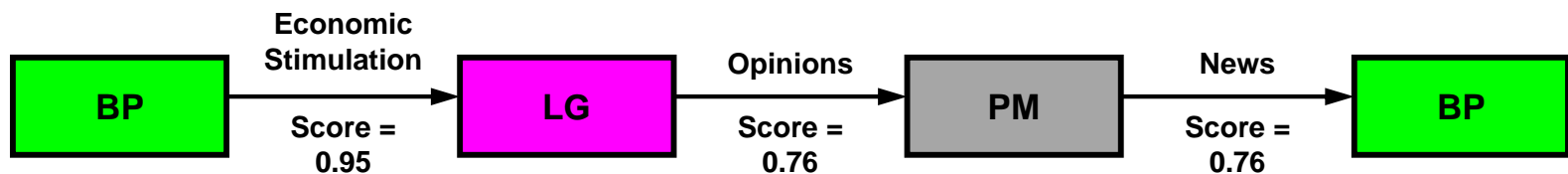|	Not	Somewhat	Important	Very	Extremely	
> 3 Years	0.02	0.07	0.12	0.17	0.22	0.22
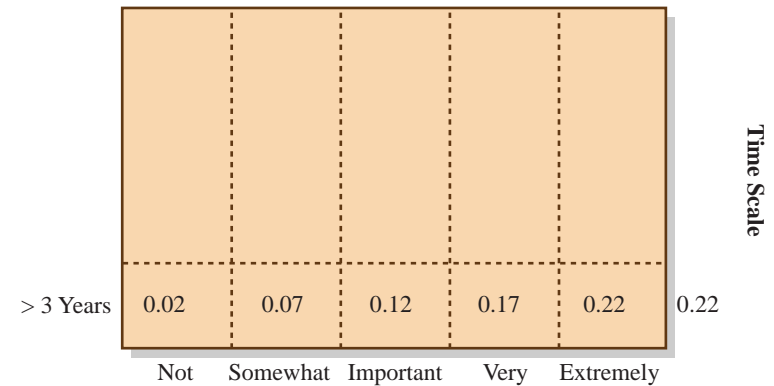
Time Scale

Importance Scale

Note:
1. All the 74 value flows can be categorized into the above table;
2. The score for value flow equals the product of its Time and Importance scales;
3. Time scale is nonlinear while Importance scale is linear;
4. Higher score is chosen for two simultaneous Time rankings;
5. All the scales and scores have been normalized

Image by MIT OpenCourseWare.

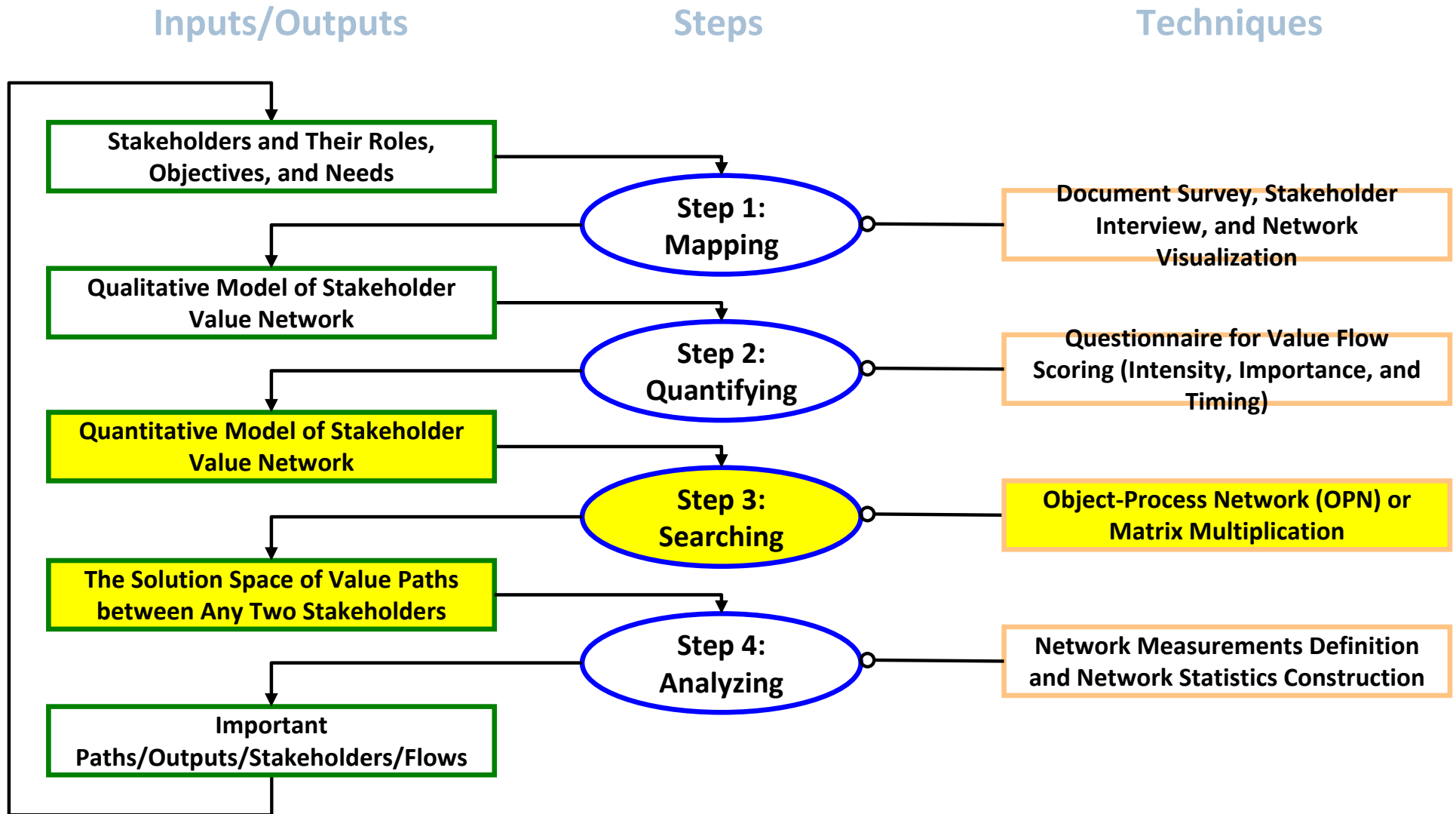# Quantitative Model for Stakeholder Value Network

☐ **Value Propagation Rule:**

■ **Value Flow:** *the output of one stakeholder and the input of another.*

■ **Value Path:** *a string of value flows connecting a group of stakeholders.*

■ **Flow Score:** *preference for a value flow ranked by the receiving stakeholder.*

■ **Path Score:** *the product of the scores of all the value flows along that path.*

■ **The Multiplicative Rule:**

| BP | → Economic Stimulation
Score = 0.95 → | LG | → Opinions
Score = 0.76 → | PM | → News
Score = 0.76 → | BP |

Path Score = Score of Economic Stimulation × Score of Opinions × Score of News = $0.95 \times 0.76 \times 0.76 = 0.549$

BP Whiting Case: Step 3 – Searching
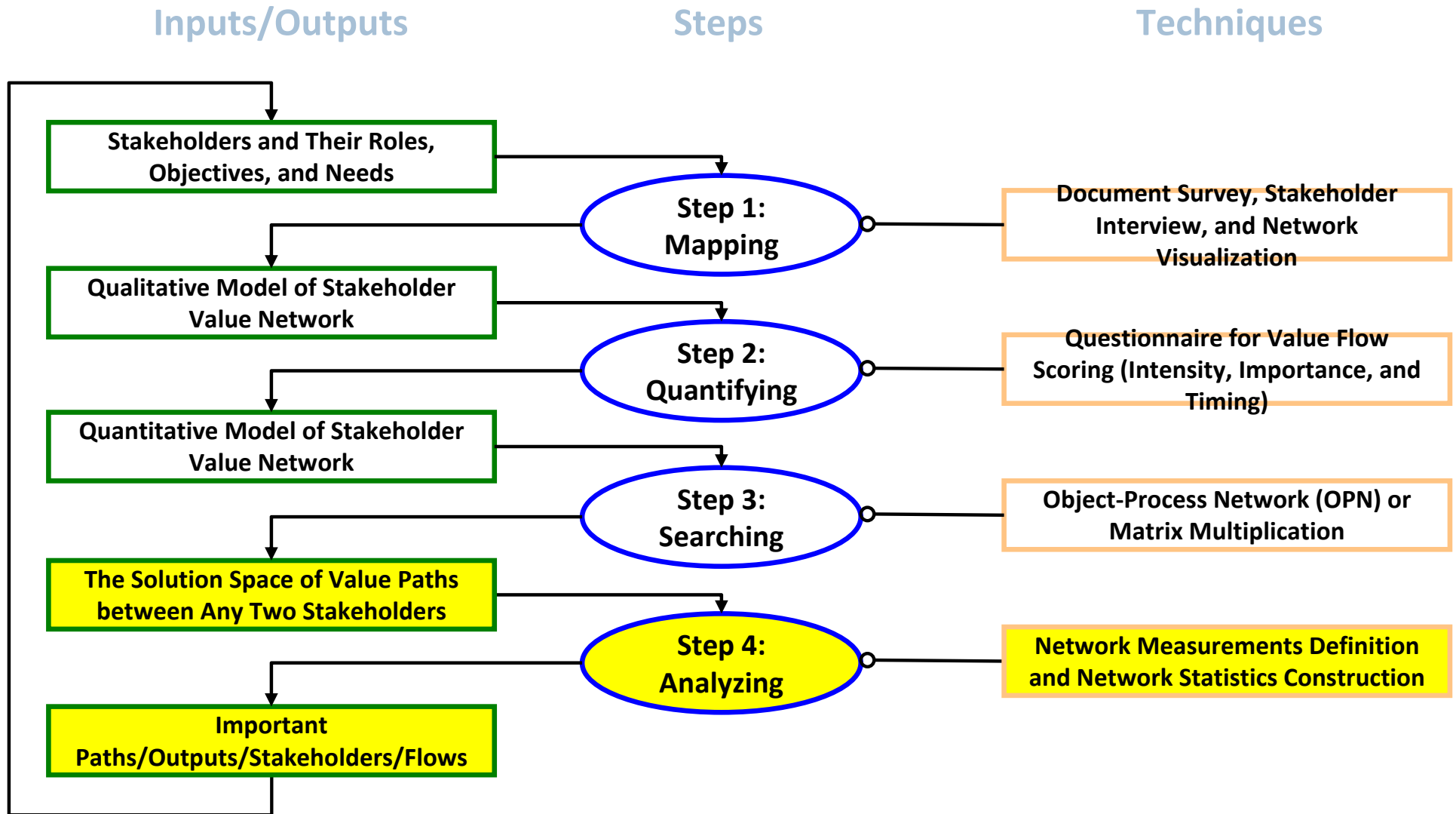
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Important Paths/Outputs/Stakeholders/Flows

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BP Whiting Case: Step 4 – Analyzing

Inputs/Outputs	Steps	Techniques

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Important Paths/Outputs/Stakeholders/Flows

Solution Space of Value Paths

☐ By the method of OPN (or Matrix Multiplication), all the value paths between any two stakeholders can be obtained.

☐ Specifically, the value paths (value cycles) beginning from and ending with the same stakeholder will be taken as the solution space to study the implications of value network for that stakeholder (the focal organization).

☐ Assuming BP as the focal organization, the following analysis demonstrates how to capture the important paths/outputs/stakeholders/flows for BP.
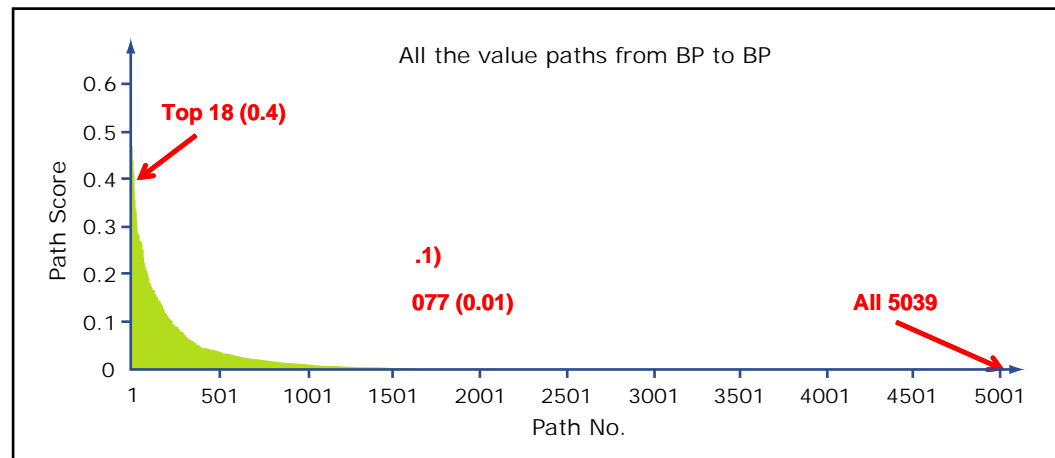
All the value paths from BP to BP

Top 18 (0.4)

.1)

077 (0.01)

All 5039

Path Score

Path No.

Image by MIT OpenCourseWare.

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BP Whiting Case: Insight B – Important Outputs

Weighted BP Output Occurrence

Top six outputs from BP

$$\sum_{i=1}^{21} WOO = 1$$
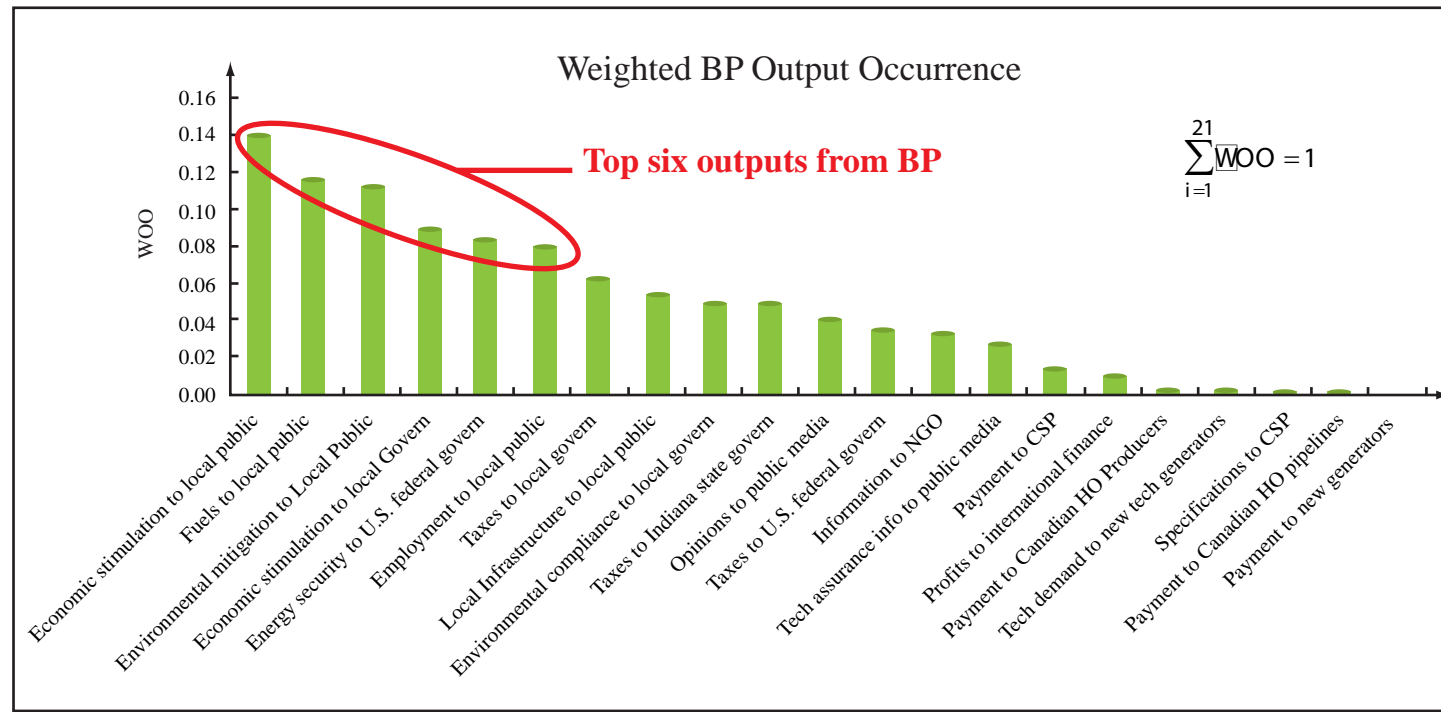
Image by MIT OpenCourseWare.

☐ Weighted Output Occurrence (WOO) = $\dfrac{\textit{Score Sum of the Value Paths Beginning with a Specific Output}}{\textit{Score Sum of All the Value Paths for the Focal Organization}}$

☐ **WOO** points out **the high-leverage outputs** BP can use to have the greatest affect on improving its own inputs (specific needs) at the end of value paths. Resources to increase these outputs should be allocated in this order.

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BP Whiting Case: Insight C – Important Stakeholders
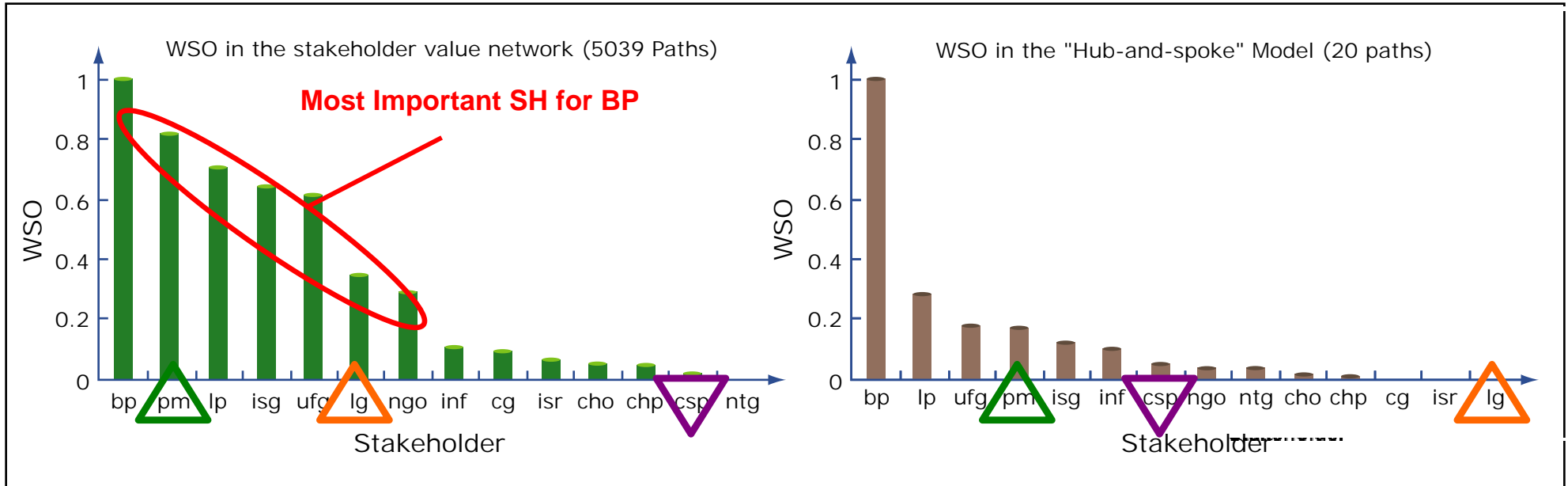
Image by MIT OpenCourseWare.

☐ Weighted Stakeholder Occurrence (WSO) = $\dfrac{\textit{Score Sum of the Value Paths Containing a Specific Stakeholder}}{\textit{Score Sum of All the Value Paths for a Focal Organization}}$

☐ **WSO** identifies **the most important stakeholders** who have the most effect on turning BP's outputs into good inputs for the success of the project.

☐ **Comparison 1 (with BP Managers' Mental Model, on Slide 7):** Public Media (pm) and Local Public (lp) are the two most important stakeholders for BP, which have been confirmed by the later facts but ignored in managers' mental model at the beginning.

☐ **Comparison 2 (with the "Hub-and-Spoke" Model, on Slide 15):** the Value Network model is closer to the later facts on important stakeholders, through considering the indirect stakeholder relationships.
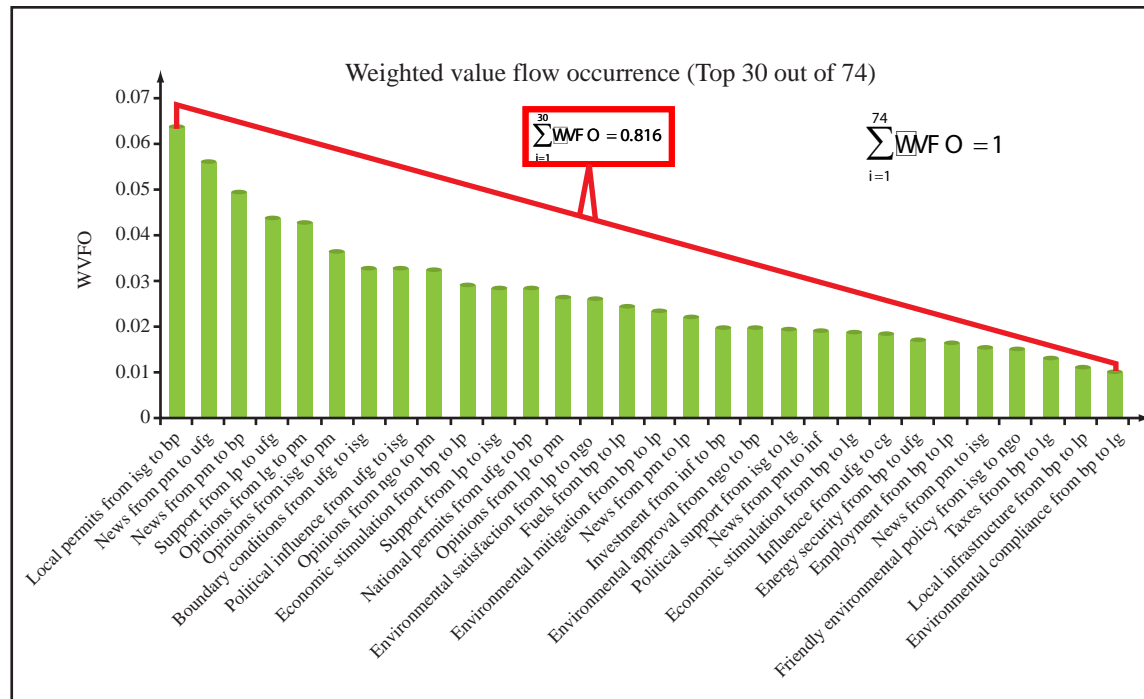
BP Whiting Case: Insight D – Important Value Flows

Image by MIT OpenCourseWare.

The chart shows "Weighted value flow occurrence (Top 30 out of 74)" with WVFO on the y-axis (0 to 0.07). It includes the annotations:

$$\sum_{i=1}^{30} \overline{W}VFO = 0.816 \qquad \sum_{i=1}^{74} \overline{W}VFO = 1$$

☐ Weighted Value Flow Occurrence (WVFO) = $\dfrac{\textit{Score Sum of the Value Paths Containing a Specific Value Flow}}{\textit{Sum (Score Sum of the Value Paths Containing a Specific Value Flow)}}$

☐ **WVFO** (and WSO) can be used as the guidance to build a smaller Stakeholder Value Network consisting of **the most important value flows** (between the most important stakeholders) to **reduce the network complexity**.

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Conclusions

- [ ] **Rigorous Framework:** to understand the qualitative/quantitative impacts of indirect relationships between stakeholders on the success of large oil and gas projects;

- [ ] **Reduced Complexity:** highlighting the important stakeholders (WSO) and the important value flows (WVFO), which can be used to construct a smaller model for more detailed analysis;

- [ ] **Strategic Insights:** identifying the critical value paths to engage stakeholders and prioritizing the high-leverage project outputs (WOO) to allocate resources;

- [ ] **Transparent, Collaborative, and Alive Platform:** for different teams in a project (and for different stakeholders) to share important knowledge that is otherwise difficult to express or communicate (through filling in the questionnaire and updating the results).

Thank you for your attention!
Questions or Suggestions?

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