

Example 5.5

BP Stakeholder Value Network

Contributors

Wen Feng, Edward F. Crawley, and Olivier L. de Weck
Massachusetts Institute of Technology

Rene Keller, Jijun Lin, and Bob Robinson
BP p.l.c.

Problem Statement

BP has secured the rights to a significant oil reservoir in a foreign country by creating a multi-billion dollar joint venture with a local corporation. While this multinational energy project will be technically challenging, there are early indications that the complexity of stakeholder relationships will pose a significant risk. In an effort to support the project in understanding these complex stakeholder relationships, we utilized a specialized type of organization architecture DSM to answer the following questions: What are the primary paths for a project to engage stakeholders? Who are the most important stakeholders for the project?

Data Collection

A stakeholder value network is a multi-relational network consisting of a focal organization, the focal organization's stakeholders, and the tangible and intangible value exchanges between the focal organization and its stakeholders, as well as between the stakeholders themselves (Feng and Crawley, 2008). To understand the impacts of both direct and indirect relationships between stakeholders (including the focal organization), a qualitative model and a quantitative model were built to populate the stakeholder value network. Correspondingly, there were two phases for data collection. First, we surveyed the relevant documents for the project and interviewed the project managers to identify major stakeholders of the project and their roles, objectives, and specific needs. These were mapped as value flows between stakeholders and then taken as the inputs for the qualitative stakeholder model. Second, we designed a questionnaire to ask the representatives of each stakeholder to characterize their specific needs from two aspects, "recipient's intensity of need" and "source's importance in fulfilling the need." These were combined into a utility score for each value flow and then taken as the inputs for the quantitative stakeholder model.

Model

Figure 5.5.1 shows a map visualizing the qualitative model of the stakeholder value network of this multinational energy project, which includes 27 value flows between 9 stakeholders. This qualitative

model can also be represented by the left DSM in Figure 5.5.2, showing the number of value flows from column stakeholders to row stakeholders. Further, the right DSM in Figure 5.5.2 shows the total utility score of value flows from column stakeholders to row stakeholders, which is calculated from the stakeholder questionnaire and provides the inputs for the quantitative model.

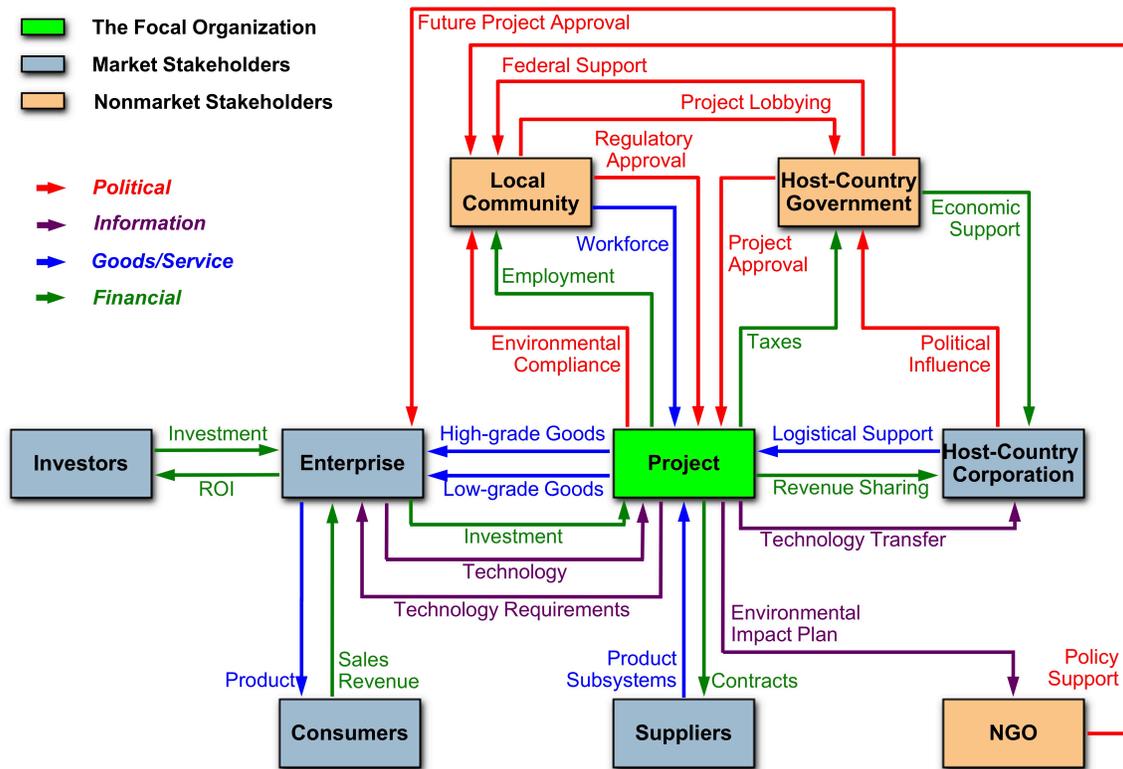


Figure 5.5.1 Stakeholder Map for the Multinational Energy Project

	pro	ent	hcc	inv	con	sup	hcg	loc	ngo
Project: pro	1	3	2			1	1	2	1
Enterprise: ent	2	1		1					
Host-Country Corporation: hcc	1		1				1		
Investors: inv		1		1					
Consumers: con		1			1				
Suppliers: sup	1					1			
Host-Country Government: hcg	1	1	1				1		
Local Community: loc	2						1	1	
NGO: ngo								1	1

	pro	ent	hcc	inv	con	sup	hcg	loc	ngo
Project: pro	1.6	1.2				0.4	0.4	1.2	0.4
Enterprise: ent	1.2	0.8	0.4						
Host-Country Corporation: hcc	0.2		0.2						
Investors: inv		0.2		0.4					
Consumers: con		0.4			0.4				
Suppliers: sup	0.4					0.4			
Host-Country Government: hcg	1.0	0.5	0.5				1.0		
Local Community: loc	1.2						0.2	1.0	
NGO: ngo								0.4	0.4

Figure 5.5.2 DSM for the Qualitative Model and the Inputs for the Quantitative Model

Based on the qualitative model and the numerical inputs from the questionnaire, a specific algorithm of DSM multiplication was designed to search all the value paths between any two stakeholders (see Figure 5.5.3), which were the basis for the quantitative model. First, a typical stakeholder value network,

or a multidigraph, can be represented by a DSM, using the addition operation to connect the names of multiple flows between the same pair of stakeholders (see M). Second, multiplying the original DSM by itself once computes a new square matrix, in which the element (i, j) in the resulting matrix represents all the paths from Stakeholder i to j with path length equal to 2 (see M^2). This result is generalizable and known in graph theory as the reachability or visibility matrix (e.g., Warfield, 1973). We had generous assistance from Yuan Mei of MIT's Computer Science and Artificial Intelligence Laboratory, who helped in optimizing and implementing the DSM multiplication analysis.

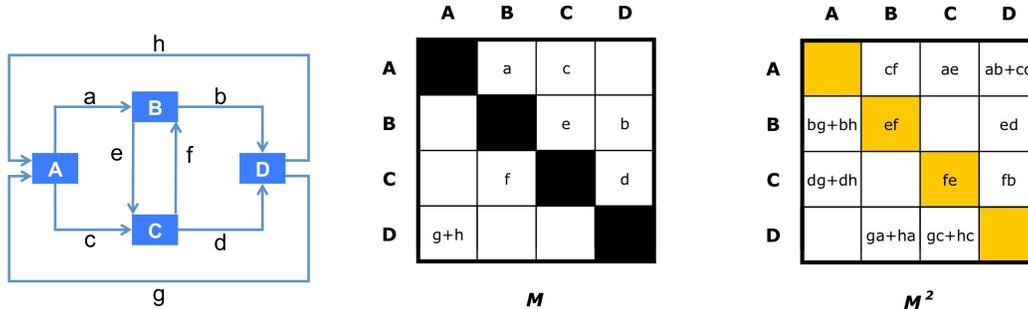


Figure 5.5.3 Example of DSM Multiplication to Compute Reachability

Using the above algorithm, Figure 5.5.4 shows the number of value paths (left) and the total utility score (right) of those paths between any two stakeholders in the multinational energy project. The diagonal elements, or all the value paths beginning from and ending with the same stakeholder, were further analyzed to study the implications of the network for that stakeholder (in this case we were most interested in the focal organization, the Project).

	pro	ent	hcc	inv	con	sup	hcg	loc	ngo
Project: pro	43	9	6	9	9	1	6	6	1
Enterprise: ent	2	20	12	1	1	2	12	12	2
Host-Country Corporation: hcc	6	17	17	17	17	6	5	14	6
Investors: inv	2	1	12	1	1	2	12	12	2
Consumers: con	2	1	12	1	1	2	12	12	2
Suppliers: sup	1	9	6	9	9	1	6	6	1
Host-Country Government: hcg	6	13	11	13	13	6	30	13	6
Local Community: loc	6	19	13	19	19	6	7	25	6
NGO: ngo	6	19	13	19	19	6	7	1	6

	pro	ent	hcc	inv	con	sup	hcg	loc	ngo
Project: pro	6.2	2.1	1.5	1.6	0.8	0.4	0.9	2.0	0.4
Enterprise: ent	1.2	2.8	1.8	0.8	0.4	0.5	1.1	2.4	0.5
Host-Country Corporation: hcc	0.8	1.2	1.1	1.0	0.5	0.3	0.3	1.0	0.3
Investors: inv	0.2	0.2	0.4	0.2	0.1	0.1	0.2	0.5	0.1
Consumers: con	0.5	0.4	0.7	0.3	0.2	0.2	0.4	1.0	0.2
Suppliers: sup	0.4	0.8	0.6	0.7	0.3	0.2	0.4	0.8	0.2
Host-Country Government: hcg	2.9	4.2	3.9	3.3	1.7	1.2	2.6	3.3	1.2
Local Community: loc	1.5	2.8	2.2	2.2	1.1	0.6	1.0	3.1	0.6
NGO: ngo	0.6	1.1	0.9	0.9	0.4	0.2	0.4	0.4	0.2

Figure 5.5.4 DSM for the Quantitative Model

Results

The following results were obtained from the numerical analysis of the stakeholder value network presented in Figure 5.5.1. The first result was a list of primary paths for the Project to engage its stakeholders, which were ranked by the path scores. Figure 5.5.5 highlights the top six paths with a length greater than two steps. These indirect paths are useful for the Project to formulate high-leverage strategies

when it is difficult to engage a stakeholder directly. For example, if the Local Community is reluctant to issue the Regulatory Approval, the Project can turn over Taxes to the Host-Country Government, and then use the Federal Support from the Host-Country Government to influence the Local Community, as shown in the first path. In fact, project managers confirmed the significance of these paths with real experience, but without the stakeholder value network analysis, supported by the DSM modeling platform, there is no rigorous way to identify these valuable indirect paths quickly, especially when the size of the network becomes large.

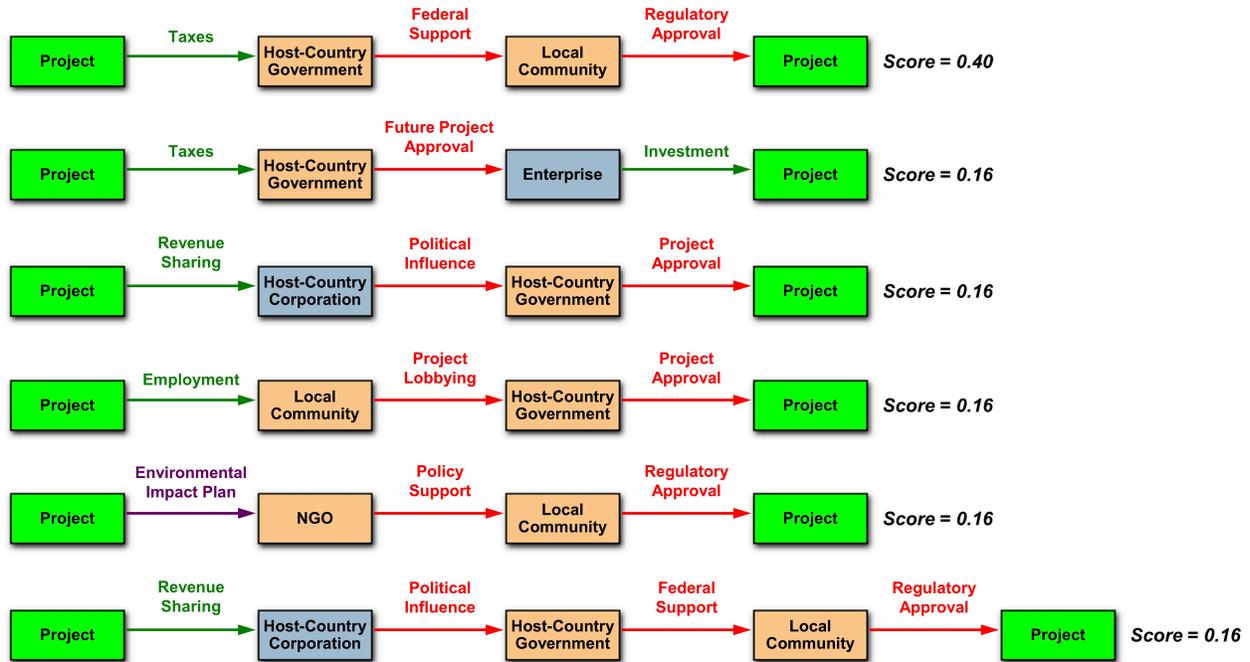


Figure 5.5.5 Project's Top Six Indirect Paths

The second result was a ranking of the relative importance of stakeholders for the Project, measured by the Weighted Stakeholder Occurrence (WSO):

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

Figure 5.5.6 compares the WSO calculated in the network model with the WSO calculated in the Hub-and-Spoke model, where only the direct relationships between the Project and its immediate stakeholders are examined. The higher importance of the Local Community and the NGO in the network model was confirmed by managers and historical facts and essentially meant that project teams—when only considering direct relationships with stakeholders—are likely to underestimate the influence of some stakeholders.

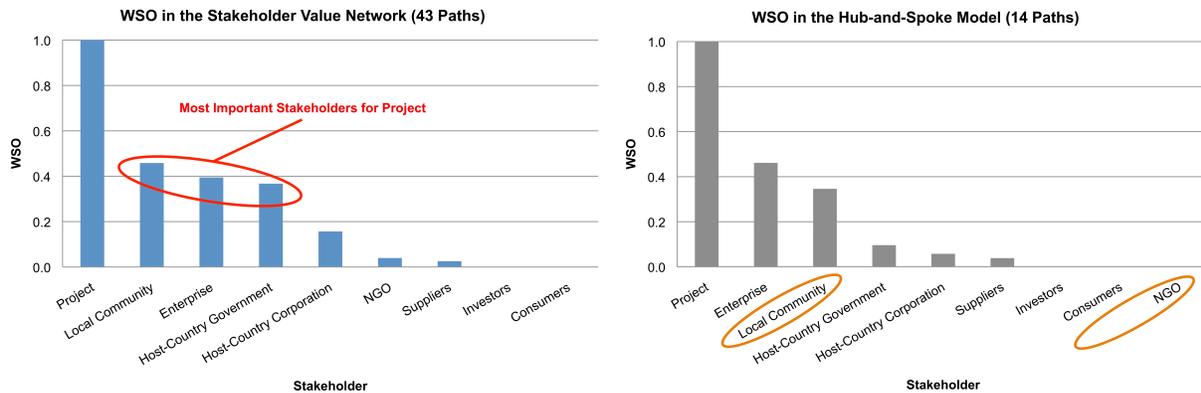


Figure 5.5.6 WSO in the Stakeholder Value Network and WSO in the Hub-and-Spoke Model

References

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