In an effort to recognize and prepare for the growing number of extreme weather events, our client is trying to assess the risk levels of its different suppliers. Today, it is lacking sufficient information on the susceptibility of its supply chain to climate change and other risks, leaving them vulnerable to disruptions in their service.

Based on conversations with the stakeholders, the primary goal of the project evolved to developing a framework for identifying aggregate supply chain risk associated with sustainability and additional risk (geopolitical, regulatory, market, etc.). We then explored resiliency strategies in response to it. This framework is based on the existing supply-chain literature and discussions with our client’s procurement team, as well as some of its suppliers. Because of limited resources and time constraints, we focused on key areas that impact our client’s supply chain most.

In terms of achieving the end goal of creating a framework that informs the utility company of risk across the various segments of their supply chain, the team performed the following related to identifying risk:

- a literature review of best practices in supply chain risk management. Publications from academia, industry, and other research institutions were considered in terms of applicability to this project.
- a review of a selection of proprietary tools and methods used currently by businesses to quantify supply chain risk.
- developed questionnaires that contained questions aimed at gathering information about the various risks associated with different segments of the supply chain. In-house utility employees and supplier management staff then completed these questionnaires.
- performed phone conversations with representatives from the utility company and their suppliers.
- used results from the questionnaires to identify potential areas of risks within various functional areas of the supply chain.
- located open-source data for visualizing climate change and geopolitical risk (categorized as uncontrollable risks). The data that was eventually utilized consisted of various functions of the supply chain.

The following approach was developed:

1. **Identify**
   - What types of risk are we exposed to and how is it affecting our company?
   - Use results from the questionnaires to identify potential areas of risks within various functional areas of the supply chain.

2. **Quantify**
   - What is the likelihood and expected impact of these risks?
   - Use results from the questionnaires to identify potential areas of risks within various functional areas of the supply chain.

3. **Respond**
   - What is our company exposed to?
   - Develop an inventory of risk factors.

4. **Mitigate**
   - What can we do to reduce the likelihood or impact of these risks?
   - Develop a process to address the risks.

**Utilization**

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- Developed questionnaires that contained questions aimed at gathering information about the various risks associated with different segments of the supply chain.
- Perform phone conversations with representatives from the utility company and their suppliers.
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**Risk Dashboard**

- Provides a high-level screening of risk areas so that when additional resources become available, they can be assigned towards investigating the “flagged” areas in more detail.

**Risk Maps**


**Fig 1: Systematic Approach for Supply Chain Risk (John, Geraniotis, Innovative Approaches to Supply Chain Risk, 2014).**

**Fig 2: Controllability of Risk and its expected impact, Simchi-Levi 2010.**

**Fig 3: Mapping Risk Categories to Questions (by type of risk).**

Questions were developed based on the internal and external risk factors described above (see Figure 3), and were mostly multiple-choice on a scale of 1-5, with a few questions left open-ended. As seen in the example questions below, answers corresponding to the 1-5 scale were either qualitative in nature with scales ranging from “Strongly Agree” to “Strongly Disagree” forwards or backwards, or somewhat quantitative, with pre-determined ranges estimated from the team’s experience and understanding of equipment procurement.

**Table 1: Example Questions from Utility Co. and Supplier Questionnaires.**

<table>
<thead>
<tr>
<th>Category</th>
<th>Utility Company Questions</th>
<th>Supplier Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sourcing</td>
<td>We are aware of our competitors or we can compare our product The materials we need for our product are not readily available.</td>
<td></td>
</tr>
<tr>
<td>Past Performance</td>
<td>This supplier has a good track record of reliability, quality and responsiveness.</td>
<td>Our suppliers have a good track record of reliability, quality and responsiveness.</td>
</tr>
<tr>
<td>Inventory</td>
<td>We maintain high levels of inventory (finished goods) of the product in-house.</td>
<td>We maintain high levels of inventory (raw materials) of the product we are sourcing</td>
</tr>
<tr>
<td>Regulations</td>
<td>Regulations are affecting our work on a daily basis.</td>
<td>Regulations are affecting our work on a daily basis.</td>
</tr>
<tr>
<td>Criticality</td>
<td>The product we are purchasing is critical to our business.</td>
<td>The product we are designing is specialized.</td>
</tr>
</tbody>
</table>