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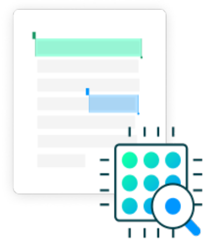

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Task 1

1. Relevant Risk Specification

Risk ID	Risk Item Description	Author	Risk Statement Condition	Risk Statement Consequence(s)	Probability	Impact	Earliest Effect	Latest Effect	Mitigation Plan	Contingency Plan
SC001	Disruptions in the supply chain for solar cell production		If there are geopolitical issues, natural disasters, or supplier issues	Then the production of solar cells may be stopped or delayed	Medium	High	Immediately	Long-term	Diversify suppliers, maintain strategic stock reserves	Establish alternative supply chains
TC002	Unstable Market dynamics in solar cell technologies		If a new, more efficient solar cell technology is developed	The current solar cell investments might lose value	Medium	High	Short-term	Long-term	Invest in R&D and ROI to stay updated with industry trends	Adapt business models to new technologies
RP003	Changes in government policies affecting solar energy		If government subsidies are reduced or regulations change	Then the demand for solar cells may decrease	Medium	High	Mid-term	Long-term	Engage in policy advocacy, diversify market presence	Adjust business strategies to new policies

1.1 Supply Chain Risks Specification

For businesses, any instability inside the supply chain poses a risk. Due to the interrelated nature of the enterprises making up the supply chain, any disruptions in one part of the chain might hurt the others. There are two types of supply chain risk: those that originate within the supply chain, such as data transfers with the potential for leakage or differences in corporate culture, and those that originate outside of it, such as the unpredictable nature of market demand or natural disasters (Harju, 2021). Risks to a company's supply chain may originate from a wide variety of sources. Unpredictability and conductivity are the two components that makeup supply chain risk. The complexity and diversity of the supply chain make it challenging for risk managers to anticipate all possible risks. Furthermore, due to the interconnected nature of the supply chain processes, the occurrence of a single risk in one part of the chain would inevitably affect the other parts as well.

Producing their first commercial solar module in 2005, First Solar made history. To cover their glass panels with two thin layers of semiconductor material—cadmium telluride and cadmium sulfide—First Solar employed their unique chemical deposition method. Separating the semiconductor into its component cells—the building blocks for light absorption and energy generation—was the next step using high-speed lasers. To increase the power output, solar cells were mixed to create modules, and then into panels (Van Gasse et al., 2020). Figure 1 displays the benefits of the First Solar supply chain. To take advantage of price alternatives and achieve economies of scale, First Solar (FS) gets its raw materials, including cells and supplies, from hundreds of suppliers worldwide. Still, the most common forms of this kind of risk—disruptions and price volatility—have an impact on the supply chain. Delays in manufacturing processes caused by regulatory clearances and mismatches constitute supply-chain interruption risk. A risk to the company's operational efficacy and reputation of price fluctuation arises from the lack of consistent and successful supply management (Singh and Hong, 2020). Major input costs, like silicon and cadmium, are very sensitive to supply and demand in the market, making them vulnerable to unpredictable price swings that cause large gaps in the company's budget.

1.2 Unstable Market Dynamics in Solar Cells

Producer and consumer actions, as well as price levels, are subject to the dynamics of the market. When supply and demand for a product or service change in a market, several factors influence the price signals that emerge. No sector or policy can be immune to the effects of market dynamics. The United States saw a doubling of solar installations between 2009 and 2011, despite consumers there being slower to embrace PV solar power than their European and Asian peers in the beginning (Kyere et al., 2024). From 5% to 7% of all PV installations in the world came from the United States in 2011. One prediction for the next five years was that the United States market share would increase at a faster rate than other countries. Solar energy's business sector has long been responsible for more than half of its growth, whereas the utility industry's size has just recently increased (Tabassum et al., 2021). The United States followed the global trend and used crystalline silicon technology for the bulk of its modules.

Solar installations in the United States increased twofold between 2009 and 2011, even though American consumers were sluggish to embrace PV solar power compared to their European and Asian peers. The United States' proportion of worldwide PV installations rose from 5% in 2010 to 7% in 2011 (O'Shaughnessy, Cruce and Xu, 2020). The projections for the following five years showed that the United States market share would increase at a faster rate than other countries. The United States reported installed solar capacity for 2010–2011 was 1,855 MW, with 16% coming from homes, 43% from businesses, and 41% from utilities.

1.3 Changes in Government Policies

Solar energy was still too costly compared to conventional fossil fuels, therefore regulatory measures were a major factor in its expansion. Solar power suppliers often saw an increase in their returns due to government incentives, which took the form of either increased pricing or mandatory purchases of solar electricity by utilities (Botterud and Auer, 2020). Take Feed-in Tariffs (FiTs) as an example. These were government-mandated tariffs that solar producers could lock into long-term contracts at prices above market. They were especially popular in Europe. Renewable portfolio requirements were another incentive that required utilities to use renewable energy sources including solar, wind, geothermal, and hydroelectric power for a certain proportion of their energy production. Among the several US states that used renewable portfolio rules, the most notable was California, which has been steadily raising its renewable percentage requirements since 2002. According to Jaxa-Rozen and Trutnevyte (2021), the demand for photovoltaic systems worldwide grew at a pace of 48% per year between 2002 and 2008. However, the solar business took a hit in early 2009 as a result of the worldwide financial crisis, which reduced government investment and made financial institutions more cautious. After 2009, demand continued to rise, but at a slower pace, thanks to existing subsidies. Few countries' incentive programmes remained in place by the beginning of 2012. It was especially noticeable in Europe, where demand declined, but at a high level. However, analysts estimated that the entire worldwide PV installed base will expand by 400-600 gigawatts by 2020, and by the end of 2011, it was 65 gigawatts. The entrance of Chinese manufacturers on a massive scale was the most significant development in solar output. According to the FS case study, Chinese manufacturers accounted for approximately 60% of the world's PV panel supply in 2012, up from less than 1% in 2001.

2a. Justification of Choice

Impact

The worldwide financial crisis of 2008–2009 hurt FS government budgets and bank health (Naqvi, 2022). Consequently, banks were no longer interested in funding solar projects, and the once-heavy European solar subsidies were gradually dwindling, leading to a loss of materials in the supply chain. The solar panels manufacturing industry, of which the firm is a member, relies heavily on its suppliers. There are a lot of essential components for any SF product, and they have to get them from a lot of different places, most of which are specific vendors. One of the main causes of supply chain risk for FS is inventory risk, which might have substantial consequences (Bø, Hovi and Pinchasik, 2022). Additionally, significant financial losses and reduced operational achievement may occur if, for example, SC encounters a problem with a critical supplier and is unable to resolve it, delaying manufacturing or preventing the acquisition of crucial manufacturing, replacing, and assistance techniques. Natural disasters pose a threat to the supply chain just as they do to the rest of society. Revisions to product development and production delays are negative effects that have alienated consumers and damaged the brand's reputation.

Since market dynamics are what affect solar cell supply and demand curves, an unstable market may have a significant influence (Tiwari et al., 2022). Numerous economic models and hypotheses rely on them. Policymakers strive to find the optimal approach to use different financial instruments to either cool down or boost an economy, as market dynamics alter the supply and demand curves. The three tenets of supply-side theory—monetary policy, regulatory policy, and tax policy—also provide a foundation for understanding market dynamics (Braunerhjelm, 2021). Production, or the availability of solar cell products and services, is the primary factor in deciding economic development, according to the general idea. In contrast to the supply-side view, the Keynesian school of thought holds that solar cell goods and services might see a decline in demand, prompting the government to step in with monetary and fiscal stimulus.

But there is also a substantial influence from changes in government policy. Shortly after establishing PV solar production leadership as a national goal in 2009, the Chinese government ratified a plethora of solar subsidy programmes, quickly propelling China to the position of global leader in solar panel output (Zhang et al., 2021). Chinese producers of crystalline silicon panels started cranking out the product in record time at rock-bottom prices, shipping more than 90% of their panels overseas. Compared to First Solar, Chinese manufacturers' research and development spending was much lower, ranging from one-third to half of what it was. Even though the public rights of way policy takes into account the possibility that large-scale solar development could affect these routes, landowners frequently consent to the creation of permissive paths for the solar farm's operations but refuse to adopt public rights of way (Gao and Yuan, 2020). The goal of reaching voluntary land agreements must be carefully considered in the strategy. When put into reality, it may serve as a helpful guide for applicants and local authorities in addressing the public rights of the implications of the planned development in a manner that respects the landowners' interests.

Probability

Since the organisation is susceptible to supply chain disruptions and has little control over many aspects of supply chain management, the likelihood of such disruptions occurring is medium. But if nothing terrible occurs, the business can keep its supply chain running smoothly. In addition, there is a medium-level possibility of government policy shifts and volatile solar cell markets. Solar cell marketing poses no threat so long as current rules and market patterns do not alter. But if solar cell subsidies or policy changes increase, FS may be in jeopardy.

2b. Risks Mitigation, Contingency and Budgetary Implications

Mitigation

Finding ways to circumvent supply chain risks caused by a single supplier should be the primary priority for management. The study's core premise is that diversifying one's supply chain makes disruptions less severe. Instead, FS may require suppliers to find other components to ensure they have enough inventory in the event of supply chain disruptions (Shih and Morlinghaus, 2020). To keep inventory levels low, we must minimise disruptions to the supply chain. Additionally, FS can diversify its suppliers and keep strategic inventory on hand.

Decrease the likelihood of unpredictability in market dynamics, such as price and currency swings, by investing in R&D and keeping abreast of industry trends. If the supervisors increase spending while keeping return on investment (ROI) in mind. An option to mitigate foreign exchange risk is to set up a forward exchange contract. An easy way to understand a forward foreign exchange agreement would be if FS wanted to buy something from Japan and the company had already signed one with a currency broker or foreign exchange bank. According to Chu, Park and Kremer (2020), these agreements specify the currencies, quantities, exchange rates, and due dates for the transaction. Financial Services and the bank or currency broker will finalise the deal when the due date comes. Buying local currency to determine the cost in local currency and then utilising that value to evaluate the total project ROI is one way to ensure sure the procurement cost is equal to the original project ROI. Borrowing money to buy raw materials and pay off foreign currency obligations is another way FS may finance its operations and limit losses caused by fluctuations in foreign currency.

Importing companies are fully responsible for ensuring that their goods, components, raw materials, and subassemblies meet all applicable safety regulations. In addition to fulfilling all applicable safety regulations, the imported goods must also be double-checked to make sure they follow all applicable laws and industry standards, and that the final consumer receives the correct labels and instructions. Given their new responsibilities, importers should always be gathering relevant data and keeping it on hand in case they ever face a legal battle (Gayialis et al., 2022). Additionally, to efficiently distribute solar cell goods and decrease the risk of government regulation, it is essential to connect with stakeholders.

Contingency Plans

Establishing other supply chains, modifying company models to accommodate new technology, and modifying corporate strategy to accommodate new regulations are contingency strategies in the event of SC disruptions, volatile market dynamics, or government actions. Producing detailed written guidelines and processes for the production and quality assurance stages requires describing the product's journey through each step of the assembly line. Paperwork is preferable when kept to a minimum. Chen et al. (2023) recommends establishing a document retention strategy specifically for investigations to help ensure the long-term preservation of records that are relevant to both investigations and product liability claims.
Significant property damage, human harm, and economic interruption may result from products that do not match specifications, particularly those that have failed during use. Product recalls may sometimes lead to negative press, damaged reputations, and diminished consumer loyalty (Lael Netzer, 2021). Producers and sellers may have prevented some of these problems by reading customer reviews and complaints. This sort of data could help a company mitigate risk by allowing them to make more informed choices before a product launch regarding potential exposures and issues.

Budgetary Implications
Table 1: Budget Implications

Risk ID	**Risk Description**	**Mitigation Plan Costs**	**Contingency Plan Costs**	**Overall Budgetary Impact**
SC001	Supply Chain Disruptions	Finding new suppliers: $100,000 Increased inventory: $500,000 Enhanced logistics: $200,000 annually	Alternative supply chains: $150,000 Emergency procurement: $300,000	Cost of goods sold increase: 5% Downtime cost reduction: $250,000 annually

TC002	Unstable Market Dynamics in Solar Cells	R&D for new tech: $1,000,000 annually Market analysis tools: $50,000 annually	Business restructuring: $500,000 Marketing for new tech: $300,000	Operational expenses increase: 10% annually Revenue growth: 15% over 3 years
RP003	Changes in Government Policies	Lobbying: $200,000 annually Market diversification: $400,000	Legal advisory: $150,000 annually Operational adjustments: $250,000	Operational costs increase: 7% annually Revenue impact: ±5% depending on policy

Task 2: Risk of Supply Chain Disruptions-SC001

Since First Solar most often faces supply chain interruption as a risk issue. To go further into this risk factor, we will be using the RiskIt analysis graph and the Ishikawa diagram. Here is the rationale for selecting these two analytical methods:

Riskit Analysis-SC001

Improvements in the precision and clarity of supply chain risk definition are a part of the Riskit methodology. Risk analysis with RiskIt simplifies the complicated process of supply chain disruption risk and provides useful, quantifiable results. Academics think about the likelihood of something occurring and the potential repercussions of that occurrence in various risk management approaches. This study offers a methodical technique that aids in providing a more detailed explanation of the risk as given in Figure 1.

Risk analysis posits that there are many advantages to engaging in risk exploration (Stern and Arias, 2011). The tool's primary value is in the thorough approach it provides and the availability of tools for precise danger identification. This strategy seeks to facilitate this by ensuring the timely and competent delivery of risk communication. To put it simply, taking action to remedy the issue will be challenging so long as the phrase 'risk' confuses. In contrast, the Risklt method provides an analysis graph that includes all the necessary elements for determining the likelihood of a given risk. This allows for the possibility of obtaining risk information via the use of Riskit diagrams (Morgan, 1993). The specialist thinks that risk analysis should begin as soon as feasible in the project. The data is reliable because the method accurately depicts the connection between risk and change and provides a visual representation of the likelihood and severity of the dangers. In addition, according to Mehreen Sirshar, Shahid, and Zoya Maqsood Alam (2019), the Risk Analysis Graph provides prompt, actionable feedback that helps enhance risk management techniques and tools. In other words, with the risk analysis approach, project managers may better anticipate and prepare for potentially dangerous events, and they can also respond quickly and effectively when these risks materialise.

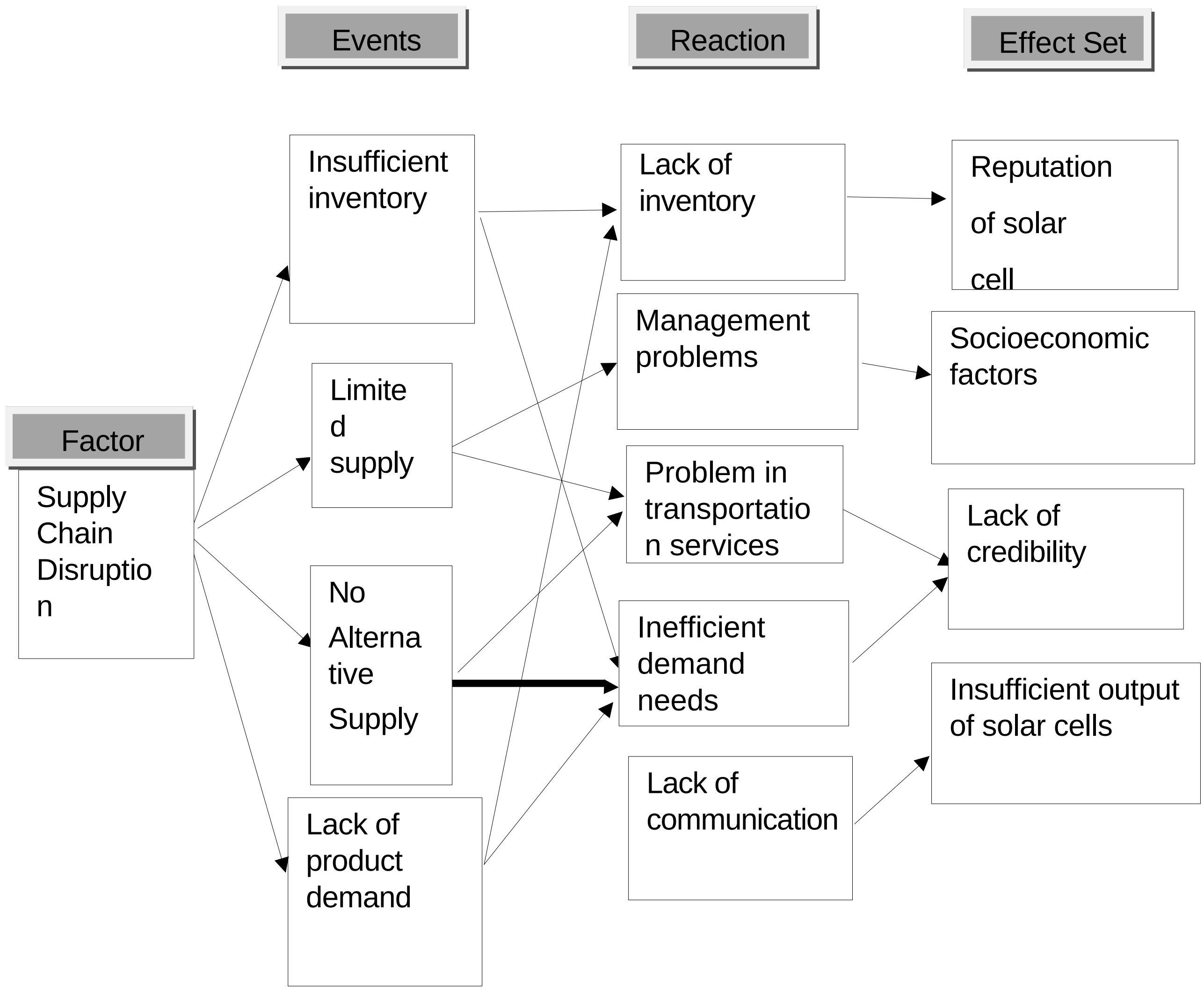

Figure 1: Riskit analysis

Ishikawa Diagram-SC001

One of the people responsible for creating the Ishikawa diagram—also called a fishbone diagram or a cause and effect map—in the 1960s was Kaoru Ishikawa as given in Figure 2 (Wong, 2011). The form of this thing is similar to the skeleton of a fish to a certain extent. Wong, Woo and Woo (2016) found that the diagram offers a concise and organised depiction by grouping the various explanations into one area and by using arrows to clearly show the link between the many causes and sub-causes. The consultant believes that an Ishikawa diagram may help simplify and make sense of this complex scenario. Ishikawa diagrams are a powerful tool that might be used throughout the project review process. The rationale for this is the assertion that the Ishikawa diagram may help identify the root causes of a problem from every angle. In addition, it works better when teams come together to brainstorm potential causes and collaborate on solutions based on a fresh perspective, all without pointing fingers or rejecting one another. The project review is the perfect time to use the Ishikawa diagram, as it helps all FS project stakeholders comprehend the root causes of problems. While some academics contend that this method provides little information on the effectiveness of the remedies, it does provide a foundation from which to develop all-encompassing answers to the problem. Also, an Ishikawa diagram may help fix the human error, thus it is useful for figuring out where future project managers need additional training—which is critical for making better, more efficient use of resources.

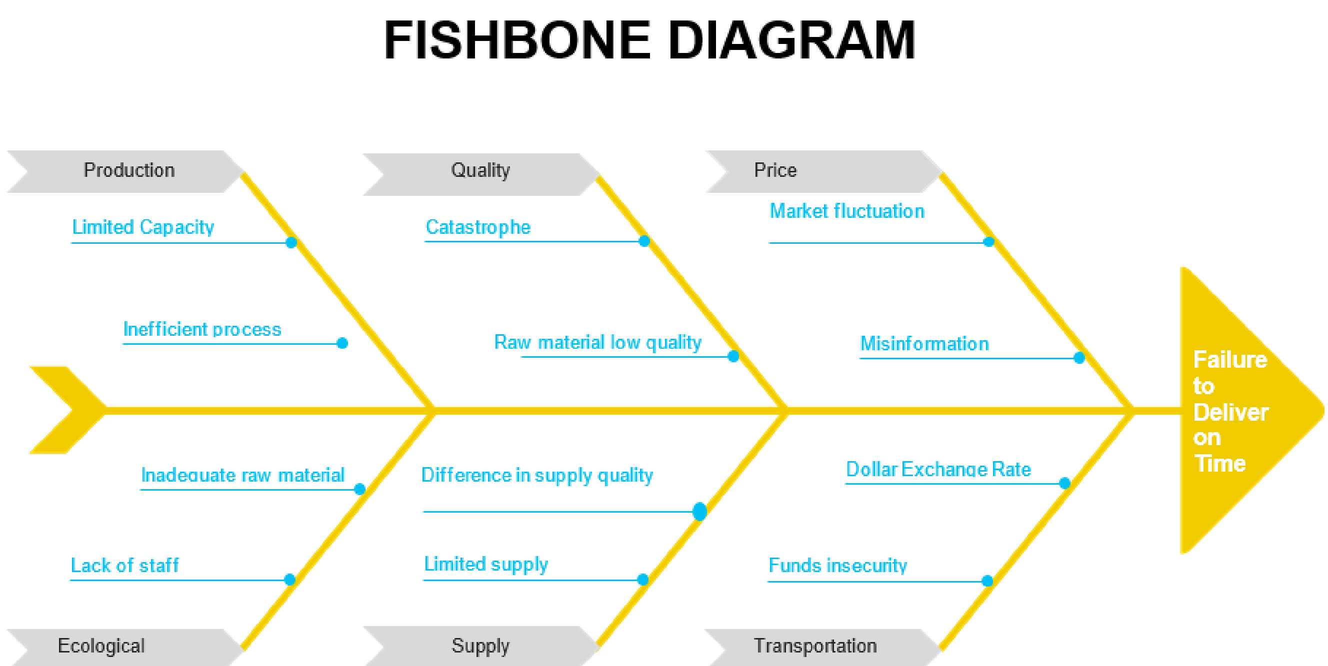

Figure 2: Fishbone Diagram

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