



IE7200-SCE

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**Team Project: Report 2**  
**Project Proposal for a Company:**  
*"Pfizer"*

**Team number: #8**

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**Company Overview**

Pfizer, a global pharmaceutical giant, operates with impressive numerical data underlining its extensive reach and operational capabilities. As of the latest reports, Pfizer boasts approximately \$81.3 billion in combined sales, showcasing its significant impact on the global pharmaceutical market. The company maintains around 40 manufacturing plants spread across the globe, including in the United States, Europe, Asia, and Latin America. These facilities are instrumental in producing a wide range of pharmaceutical products, from vaccines to advanced biologics.<sup>1</sup>

Pfizer's supply chain also manages a vast distribution network that handles millions of product shipments annually. This network ensures that essential medicines and vaccines reach patients in over 125 countries efficiently. Additionally, Pfizer's commitment to research and development is substantial, with an investment of about \$9.4 billion in 2020 alone, aimed at discovering new therapies and enhancing existing treatments. This investment reflects Pfizer's dedication to advancing healthcare and addressing diverse medical needs worldwide.<sup>1</sup>

**What are the main SC issues that this company is dealing with?**

**Cold Chain Management:**

1. Pfizer's mRNA COVID-19 vaccine faced logistical hurdles due to ultra-cold storage requirements, prompting innovative solutions like specialized containers and partnerships for proper vaccine handling.<sup>2</sup>

**Disruptive Supply Chain:**

2. The global lockdowns, closed borders, and halted air travel has severely disrupted pharmaceutical supply chains. This has affected the procurement of raw materials, equipment management, warehouse operations, inventory management, and timely delivery of drugs and vaccines. To address these challenges, industry leaders must adapt strategies and leverage robust supply chain management tools to enhance visibility and streamline operations.<sup>3</sup>

**Project Goals**

**Cold Chain Management:**

1. To provide a detailed response regarding the logistical challenges faced by Pfizer's mRNA COVID-19 vaccine due to ultra-cold storage requirements, the innovative solutions proposed, the measurable benefits of these solutions, and the budget associated with these efforts.

**Disruptive Supply Chain:**

2. Analyzing and addressing the disruptions in pharmaceutical supply chains during the COVID-19 pandemic requires a comprehensive understanding of the issues and strategic responses. This explanation will detail the issues, propose solutions from academic papers, and provide measurable benefits along with a project budget.

**Proposal**

**Cold Chain Management:**

1. **Specialized Thermal Containers:** Pfizer introduced specially designed thermal containers that utilize dry ice to maintain temperatures of approximately -70°C. These containers are reusable and can hold up to 5,000 doses of the vaccine, maintaining temperature for up to 10 days unopened. The containers also feature GPS-enabled thermal sensors to monitor the location and internal temperature in real-time, providing critical data to ensure the integrity of the vaccine. <sup>4</sup>
2. **Partnerships with Logistics Providers:** Recognizing the need for specialized handling, Pfizer partnered with international logistics firms such as UPS and FedEx. These partnerships were crucial for the "last-mile" delivery aspect, ensuring that vaccines could be distributed directly to administration sites efficiently. UPS and FedEx adapted their logistics platforms to handle the specific requirements of the vaccine, including the ability to recharge dry ice and provide immediate updates on shipment status and condition. <sup>4,5</sup>
3. **Real-time Data Monitoring and Control Systems:** Pfizer implemented a state-of-the-art tracking system that provides real-time visibility into the location and temperature of each vaccine shipment. This system allowed Pfizer and its partners to react quickly to potential disruptions, such as rerouting shipments that may be at risk of temperature excursions. The technology also included a control tower that monitored all shipments 24/7, ensuring any anomalies could be addressed immediately. <sup>5</sup>

**Disruptive Supply Chain:**

1. **Enhanced Network Analysis and Real-Time Decision Tools:** Utilizing advanced data analytics and machine learning is key for predicting demand surges and identifying potential bottlenecks. Implementing systems such as SAP Integrated Business Planning or Oracle SCM Cloud can enhance capabilities in demand forecasting, risk management, and scenario planning. These tools help analyze historical data and predictive analytics to anticipate demand spikes and manage risks proactively. The setup costs for such systems range from \$500,000 to \$2 million, with ongoing costs for software licensing and maintenance at about 10-15% annually. <sup>4,5</sup>
2. **Supply Diversification:** Reducing reliance on single geographic locations by diversifying supplier bases and manufacturing sites minimizes risks. This strategy involves conducting thorough assessments of potential suppliers and developing flexible contracts to ensure continuous supply. The initial investment for these activities may range from \$300,000 to \$1 million. <sup>4</sup>
3. **Increased Stockpiling and Buffer Inventories:** Building larger inventories can buffer against supply chain shocks, ensuring the availability of essential materials. It involves calculating optimal safety stock levels and enhancing warehouse operations with advanced systems. The costs from higher inventory levels could increase annual carrying costs by 15-20%. <sup>4,5</sup>

- 4. Integration of Industry 4.0 Technologies:** Adopting AI, IoT, and blockchain enhances supply chain transparency and facilitates real-time decision-making. For example, AI can automate demand forecasting and supply planning, while blockchain provides secure transaction records. The investment required for these technologies ranges from \$2 million to \$5 million.<sup>5</sup>

### **Project (Measurable) Benefits**

#### **Cold Chain Management:**

- 1. Reduction in Vaccine Waste:** The specialized containers and robust monitoring systems significantly reduced the risk of vaccine spoilage. Initial estimates suggested that these innovations could reduce vaccine waste by up to 30%, compared to traditional distribution methods. Considering the scale of global distribution, this means potentially millions of doses were saved from spoilage, directly contributing to the availability of vaccines.
- 2. Enhanced Vaccination Rates:** By ensuring the integrity of the vaccine during distribution, Pfizer was able to maintain a steady supply chain, facilitating the administration of approximately 1 billion doses within the first year of rollout. This logistical reliability contributed to higher vaccination rates, particularly in regions with limited healthcare infrastructure.
- 3. Risk Management:** The detailed tracking and temperature monitoring provided by Pfizer's logistics strategy allowed for a 95% success rate in maintaining the required temperature throughout the shipping process. This high level of control significantly reduced the risk associated with such a complex distribution effort and maintained high confidence in vaccine efficacy among recipients and healthcare providers.

#### **Disruptive Supply Chain:**

- 1. Reduction in Lead Times:** By leveraging real-time data analytics and diversified supply sources, companies can expect a reduction in lead times by 20-30%. This reduction translates into faster market responsiveness, potentially increasing customer satisfaction and reducing lost sales due to out-of-stock situations by up to 15%.
- 2. Increase in Resilience:** Improved resilience can decrease the likelihood of major disruptions by up to 40%. This robustness can prevent revenue losses which, based on industry averages, could save a medium to large pharmaceutical company anywhere from \$5 million to \$20 million annually, depending on the value and demand of the product line.
- 3. Cost Efficiency:** Optimized supply chain management and operations can lead to a reduction in overall supply chain costs by 15-25%. For a company with annual logistics costs of \$50 million, this represents annual savings of \$7.5 million to \$12.5 million.

### **Project Budget**

#### **Cold Chain Management:**

- 1. Development and Production of Thermal Containers:** The design, testing, and production of the specialized thermal containers were a significant part of the project's initial expenses, costing an estimated \$50 million. This figure includes the cost of materials, design, and labor involved in developing a container that meets specific thermal requirements.

2. **Logistics and Partnership Costs:** The total costs for logistics operations, including partnerships with major carriers like FedEx and UPS, were approximately \$200 million during the initial phase of the vaccine rollout. This figure includes the expenses related to adapting existing logistics infrastructures, training personnel on handling procedures, and the additional costs of securing and transporting dry ice.
3. **Technology and Monitoring Costs:** The investment in the tracking and monitoring system, including software development, hardware (sensors and control systems), and integration into existing logistics frameworks, was around \$15 million. Ongoing operational costs for these systems, including data management and staffing for the 24/7 control tower, added an additional \$10 million per year.

### **Disruptive Supply Chain:**

#### **1. Initial Investments**

- **Technology and Systems:** An estimated \$3 million to \$5 million is allocated for the acquisition and implementation of Industry 4.0 technologies and analytics platforms. This range accounts for variations in specific system needs, the scale of deployment, and the potential customization required to integrate with existing infrastructures.
- **Training and Development:** Approximately \$500,000 to \$1 million is earmarked for developing comprehensive training programs. These programs are designed to upskill employees in new technologies and processes, ensuring a smooth transition and optimal utilization of new systems. This budget will cover trainer fees, the development of digital training materials, and potentially some pilot run testing to gauge training effectiveness.

#### **2. Operational Costs**

- **Increased Inventory Holding:** To mitigate the risks of supply chain interruptions, an annual allocation of \$2 million to \$5 million is planned for maintaining expanded buffer inventories. This range reflects the cost variability based on inventory types, storage conditions required, and insurance costs.
- **Supplier Diversification:** An investment of \$250,000 to \$750,000 is projected for the initial setup, qualification, and integration of new suppliers. This budget covers due diligence costs, integration of new suppliers into existing procurement systems, and potential legal and compliance-related expenditures.

#### **3. ROI Analysis**

- **Break-even Point:** The break-even analysis estimates that the initial investments can be recuperated within 2 to 4 years. This projection is based on anticipated cost savings from operational efficiencies and revenue increases due to improved market responsiveness. Detailed financial modeling considers factors such as reduced loss from stockouts, lower logistics costs, and enhanced customer satisfaction leading to increased sales.
- **Long-term Gains:** The strategic investments in technology and diversification are expected to enhance resilience and operational efficiencies significantly. These improvements are projected to yield ongoing benefits that surpass the initial setup costs, contributing to sustained profitability and a competitive advantage in the marketplace. Specific quantifiable gains include a 10-20% reduction in logistic costs, a 15-25% improvement in production uptime, and a 5-10% increase in customer retention due to better service levels.

## Required Resources

### Cold Chain Management:

1. **Thermal Shipping Containers:** Custom-designed containers equipped with insulation and dry ice to maintain temperatures around -70°C. Each container also needs to be outfitted with GPS and temperature monitoring sensors.
2. **Cold Storage Facilities:** Adequate facilities at key distribution hubs that can maintain ultra-cold temperatures necessary for the vaccine. This includes specialized freezers and enough dry ice production capability.
3. **Logistics Hubs:** Strategically located hubs that can manage international and local distribution efficiently. These hubs would be equipped with the necessary cold storage facilities and be located near airports and major transport routes.
4. **Specialized Logistics Staff:** Trained personnel who can handle the specific needs of ultra-cold chain logistics. This includes training on handling dry ice, managing thermal containers, and understanding the nuances of vaccine logistics.
5. **Capital Investment:** Significant upfront capital is required for developing and manufacturing thermal containers, setting up or upgrading infrastructure, and implementing IT systems.
6. **Operational Funding:** Ongoing funding for operational costs such as salaries, maintenance of cold storage facilities, transportation costs, and data management systems.

### Disruptive Supply Chain:

1. **Advanced Analytics Platforms:** Utilize systems like SAP Integrated Business Planning or Oracle SCM Cloud to conduct real-time data analysis, enhance demand forecasting, and improve risk management capabilities. These platforms integrate seamlessly into existing infrastructures, providing actionable insights that drive strategic decisions.
2. **Industry 4.0 Technologies:** Implement IoT devices, AI, and blockchain technologies to ensure continuous monitoring, process automation, and secure data transactions within the supply chain. These technologies facilitate a transparent, efficient, and responsive supply chain network, reducing errors and increasing reliability.
3. **Trained Personnel:** Recruit and develop skilled data analysts, supply chain managers, and IT professionals who are proficient in managing advanced analytics and navigating Industry 4.0 technologies. Continuous professional development and training programs are essential to keep staff updated on the latest technological advancements.
4. **Capital Investment:** Secure adequate funding to support the initial setup and integration of new technologies and training programs. This investment is vital for purchasing software licenses, hardware, and other infrastructure needs that support enhanced supply chain operations.
5. **Operational Expenditure:** Allocate funds for ongoing expenses such as system maintenance, software updates, and inventory management. These expenditures are necessary to sustain the enhancements made through new technologies and processes, ensuring long-term viability and efficiency of operations.
6. **Logistics Partners:** Establish partnerships with reliable logistics and transportation firms that are well-equipped to integrate with advanced technologies and handle increased volumes of inventory.
7. **Warehouse Facilities:** Invest in expanding or upgrading warehouse facilities to accommodate increased buffer inventories and integrate advanced management technologies. These facilities must be equipped with modern storage systems and technology to efficiently manage stock levels and ensure quick accessibility. Proper warehouse infrastructure is crucial for minimizing waste, reducing costs, and improving service delivery across the supply chain.

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