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Msc Engineering Project Management

Procurement and Supply Chain Management

Improving Performance Of Supply Chain

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INTRODUCTION

Supply chain is the process from the initial raw materials to the ultimate consumption of the finished products linking across supplier-user companies; and outside a company that enable the value the chain value to make products and provide services to the customer.

Proper identification of customer service requirements, determination of inventory placement levels and creation of effective policies and procedures for the effective coordination of supply chain activities is necessary so as to achieve effective and proper management of supply chain systems. Improvement of all supply chain processes quality will result to reduction in costs, improvement of resource utilization and improvement in the process efficiency.

It is essential to evaluate all areas of the processes and to provide solutions to some problems with respect to logistic issues so as to comply with the supply chain requirements, a strong communication medium between supplier and customer should also be put in place so as to make the supply chain performance more efficient.

A key point in supply chain management is that the entire process must be viewed as one system. Any inefficient incurred across the supply chain, which may stem from suppliers, manufacturing plans, warehouses or customers must be assessed to determine the true capabilities of the process

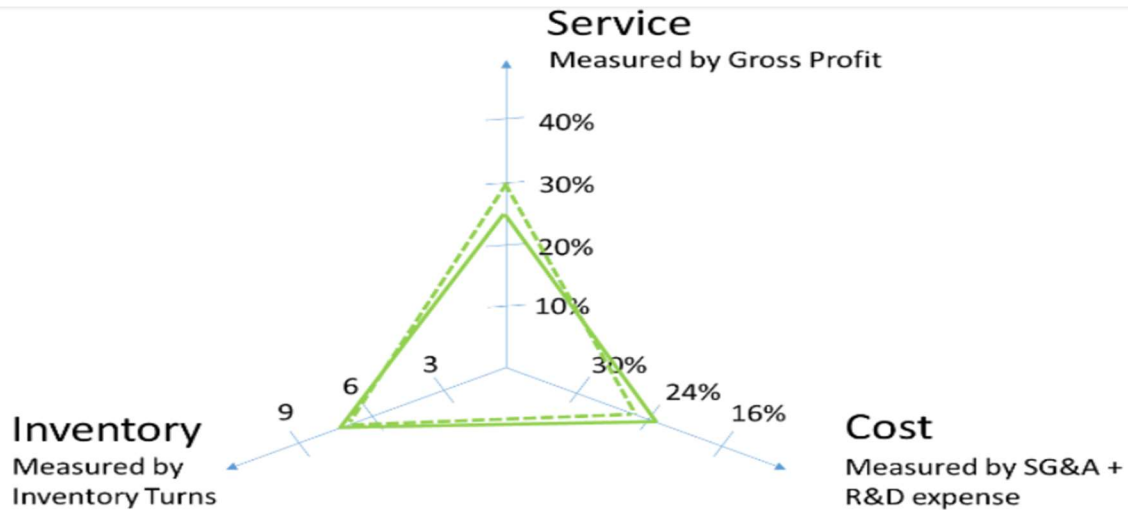
CRITICAL EVALUATION OF THE OIL AND GAS SUPPLY CHAIN VULNERABILITY

Operations Management Triangle

Setting a direction and balancing the competing goals of service, cost, and cash needs to be the at the forefront of supply chain management, supply chain management often faces substantial pressure, as it is called upon to achieve multiple goals.



A company can be a product leader, service leader or a cost leader, a service leader, or a cost leader, but it cannot shine in all three areas at the same time. Many manufacturers plagued by a multipronged quandary which as low service and low delivery performance coupled with high cost and high levels of tied-up working capital. Solving for dilemma is a task that typically falls to the supply chain management function, which is often seen as an auxiliary function and is called upon to do the impossible such as balancing the opposing aims of the various departments, including sales, manufacturing, and finance. The costs can be summarized as delivering higher service levels and lower costs while freeing up cash.



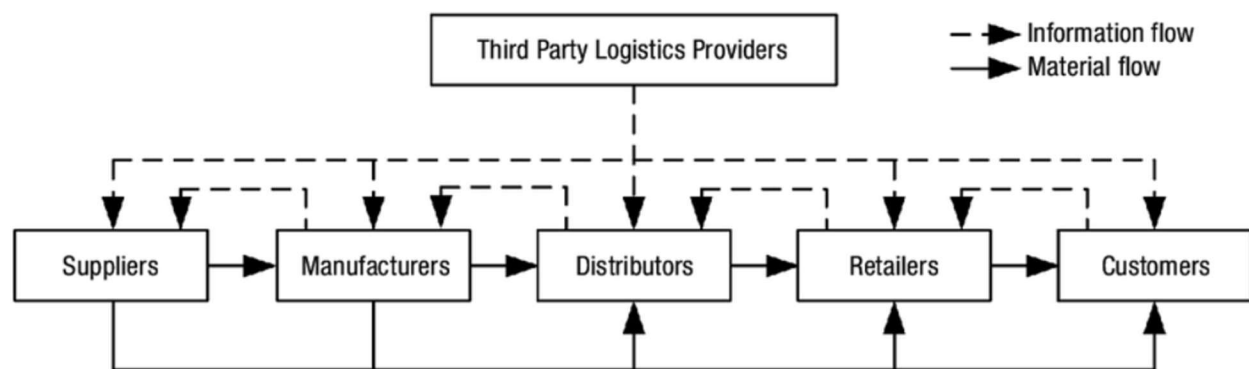
Maximizing services levels while simultaneously minimizing costs and capital employed is a difficult undertaking, given their diametrically opposed nature: Higher costs, whereas reducing costs and capital employed places pressure on service levels. The effort puts undue pressures on supply chain managers hindering them from focusing on the activities that matter most in their work: demand forecasting; inventory control; monitoring of risk; and scheduling of replenishments, to name just a few.

Supply chain management

supply chain management (SCM) lets an organization get the right goods and services to the place they're needed at the right time, in the proper quantity and at an acceptable cost. Efficiently managing this process involves overseeing relationships with suppliers and customers,

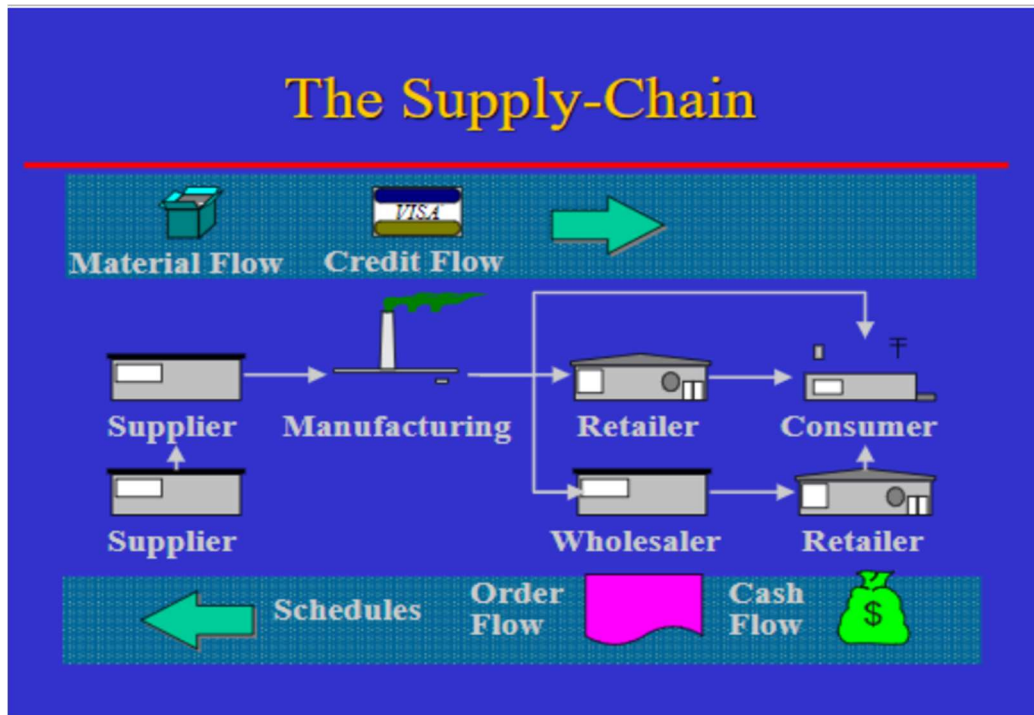
controlling inventory, forecasting demand and getting constant feedback on what's happening at every link in the chain.

The supply chain involves several elements such as production transportation, location and inventory. Juggling these elements involves record-keeping, tracking and analysis by many departments. Supply chain software, especially large, integrated packages, combines many different technologies to give a single view of supply chain data that can be shared with others.

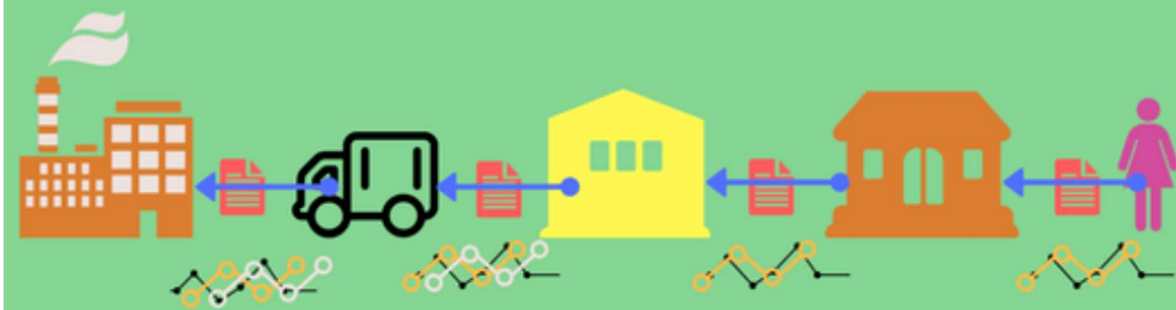


Each link in the supply chain has to keep a certain inventory of raw materials, parts, subassemblies and other goods on hand as a buffer against uncertainties and un-predictabilities. Shutting down an oil assembly plant because an expected parts shipment didn't arrive is expensive. But inventory costs money too, so it's important to manage deployment strategies, determine efficient order quantities and reorder points, and set safety stock levels.

The Supply-Chain



What is Supply Chain?



Choosing the best way to transport crude often involves trading off the shipping cost against the indirect cost of inventory. For example, shipping by air is generally fast and reliable. Shipping by sea or rail will likely be cheaper, especially for bulky goods and large quantities, but slower and less reliable. So, if you ship by sea or rail, you have to plan further in advance and keep larger

inventories than you do if you ship by air. Shipping the oil by pipeline will be the safest, fastest and cheapest of all hence should be considered as the first means of transporting the oil.

Supply chain management applications fall into two main categories: planning applications and execution applications. Planning applications determine the best way to route materials and the quantities of goods needed at specific points. When such applications work well, they make possible the "just-in-time" delivery of goods. Execution applications track financial data, the physical status and flow of goods, and ordering and delivery of materials.



Proper supply chain management plan has wide range of importance to both the supplier and the customers, the following are importance of having a well-planned supply chain management:

Advantages of a well-planned supply oil and gas supply chain

- Customers expect the correct product assortment and quantity to be delivered.
- Customers expect products to be available at the right location. (i.e., customer satisfaction diminishes if an auto repair shop does not have the necessary parts in stock and can't fix your car for an extra day or two).
- Right Delivery Time – Customers expect products to be delivered on time (i.e., customer satisfaction diminishes if pizza delivery is two hours late or Christmas presents are delivered on December 26).
- Right After Sale Support – Customers expect products to be serviced quickly. (i.e., customer satisfaction diminishes when a home furnace stops operating in the winter and repairs can't be made for days)
- Decreases Purchasing Cost – Retailers depend on supply chains to quickly deliver expensive products to avoid holding costly inventories in stores any longer than necessary. For example, electronics stores require fast delivery of 60" flat-panel plasma HDTV's to avoid high inventory costs.
- Decreases Production Cost – Manufacturers depend on supply chains to reliably deliver materials to assembly plants to avoid material shortages that would shut down production. For example, an unexpected parts shipment delay that causes an auto assembly plant shutdown can cost \$20,000 per minute and millions of dollars per day in lost wages.

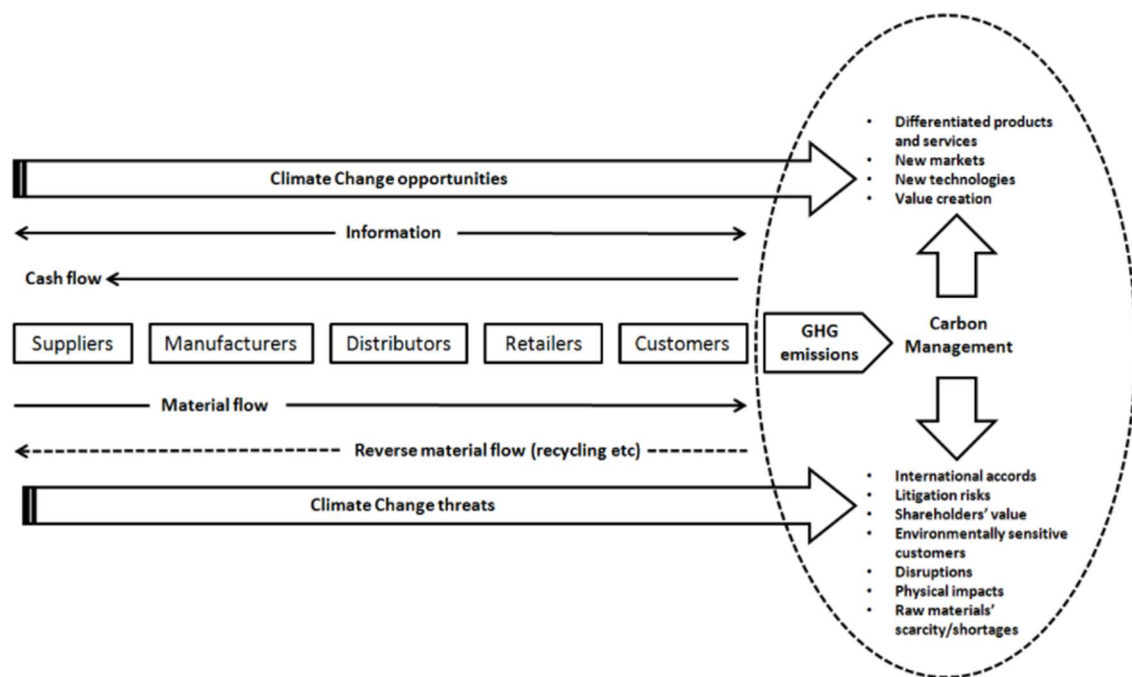
- Decreases Total Supply Chain Cost – Manufacturers and retailers depend on supply chain managers to design networks that meet customer service goals at the least total cost. Efficient supply chains enable a firm to be more competitive in the market place. For example, Dell's revolutionary computer supply chain approach involved making each computer based on a specific customer order, then shipping the computer directly to the customer. As a result, Dell was able to avoid having large computer inventories sitting in warehouses and retail stores which saved millions of dollars. Also, Dell avoided carrying computer inventories that could become technologically obsolete as computer technology changed rapidly.
- Increases Profit Leverage – Firms value supply chain managers because they help control and reduce supply chain costs. This can result in dramatic increases in firm profits. For instance, U.S. consumers eat 2.7 billion packages of cereal annually, so decreasing U.S. cereal supply chain costs just one cent per cereal box would result in \$13 million dollars saved industry-wide as 13 billion boxes of cereal flowed through the improved supply chain over a five-year period.
- Decreases Fixed Assets – Firms value supply chain managers because they decrease the use of large fixed assets such as plants, warehouses and transportation vehicles in the supply chain. If supply chain experts can redesign the network to properly serve U.S. customers from six warehouses rather than ten, the firm will avoid building four very expensive buildings.
- Increases Cash Flow – Firms value supply chain managers because they speed up product flows to customers. For example, if a firm can make and deliver a product to a customer in 10 days rather than 70 days, it can invoice the customer 60 days sooner.

Lesser known, is how supply chain management also plays a critical role in society. SCM knowledge and capabilities can be used to support medical missions, conduct disaster relief operation and handle other types of emergencies. Whether dealing with day-to-day product flows or dealing with an unexpected natural disaster, supply chain experts roll up their sleeves and get busy. They diagnose problems, creatively work around disruptions, and figure out how to move essential products to people in need as efficiently as possible.

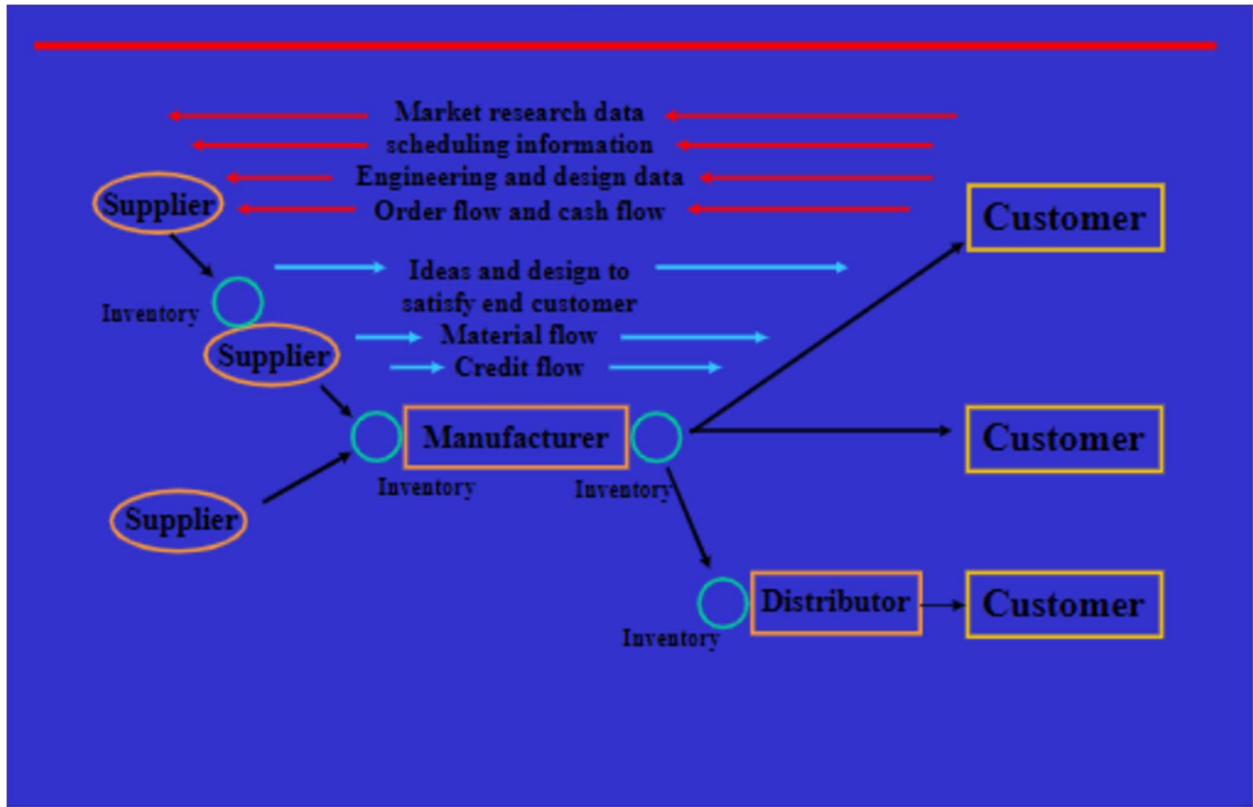
- Supply chain management helps Sustain Human Life – Humans depend on supply chains to deliver basic necessities such as food and water. Any breakdown of these delivery pipelines quickly threatens human life. For example, in 2005, Hurricane Katrina flooded New Orleans, LA leaving the residents without a way to get food or clean water. As a result, a massive rescue of the inhabitants had to be made. During the first weekend of the rescue effort, 1.9 million meals and 6.7 million liters of water were delivered.
- Supply chain management Improves Human Healthcare – Humans depend on supply chains to deliver medicines and healthcare. During a medical emergency, supply chain performance can be the difference between life and death. For example, medical rescue helicopters can save lives by quickly transporting accident victims to hospitals for emergency medical treatment. In addition, the medicines and equipment necessary for treatment will be

available at the hospital as a result of excellent supply chain execution

- Supply chain management Protects Humans from Climate Extremes – Humans depend on an energy supply chain to deliver electrical energy to homes and businesses for light, heat, refrigeration and air conditioning. Logistical failure (a power blackout) can quickly result in a threat to human life. For example, during a massive

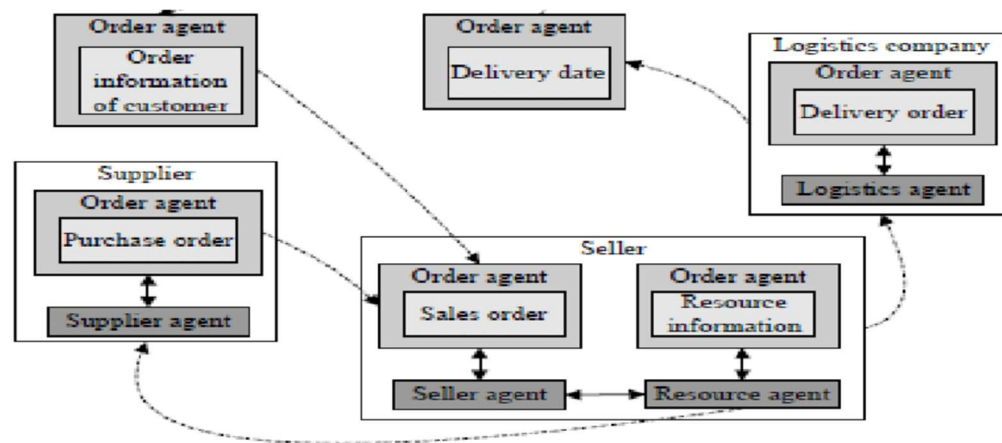


- East Coast ice storm in January 1998, 80,000 miles of electrical power lines fell resulting in no electricity for 3,200,000 Montreal, Quebec residents. Due to extreme cold, 30 died and 25% of all Quebec residents left home to seek heated shelter. In addition, economic costs included \$3 billion in lost business, \$1 billion in home damage and \$1 billion in government

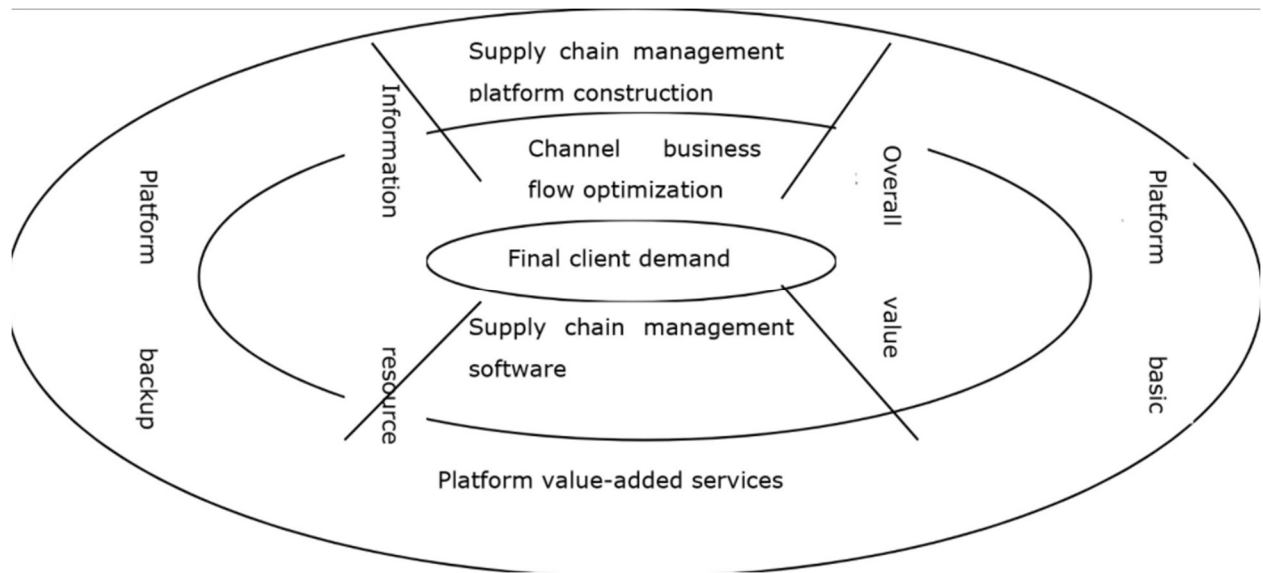


Information sharing within supply chain

Information is crucial to supply chain performance because it provides the foundation on which supply chain processes execute transactions and managers make decisions. Without information, a manager cannot know what customers want, how much inventory is in stock, and when more products should be produced or shipped



Information sharing has been cited as one of the major means to enhance supply chain performance. It allows companies to better coordinate their activities with their supply chain partners that lead to increased performance. This study conceptualizes and assesses several factors that influence the degree of information sharing in supply chains, namely integrated information technologies, internal integration, information quality and costs–benefits sharing. The relationship between the degree of information sharing and organizational performance is then tested. Data from 150 manufacturing companies were collected and proposed relationships are examined using structural equation modelling.



The results show that integrated information technologies and information quality have positive influence on the intensity of information sharing. However, internal integration and costs–benefits sharing

Potential risks which could threaten supply of oil

Political Risk

The primary way that politics can affect oil is in the regulatory sense, but it's not necessarily the only way. Typically, an oil and gas company are covered by a range of regulations that limit where, when and how extraction is done. This interpretation of laws and regulations can also differ from state to state. That said, political risk generally increases when oil and gas companies are working on deposits abroad.

Oil and gas companies tend to prefer countries with stable political systems and a history of granting and enforcing long-term leases. However, some companies simply go where the oil and gas is, even if a particular country doesn't quite match their preferences. Numerous issues may arise from this, including sudden nationalization and/or shifting political winds that change the regulatory environment. Depending on what country the oil is being extracted from, the deal a company starts with is not always the deal it ends up with, as the government may change its mind after the capital is invested, in order to make more profit for itself.

Political risk can be obvious (such as developing in countries with an unstable dictatorship and a history of sudden nationalization), or more subtle, (as found in nations that adjust foreign ownership rules to guarantee that domestic corporations gain an interest). An important approach that a company takes in mitigating this risk includes careful analysis and building

sustainable relationships with international oil and gas partners—if it hopes to remain in business for the long run.

Geological Risk

Many of the easy-to-get oil and gas is already tapped out, or in the process of being tapped out. Exploration has moved on to areas that involve drilling in less friendly environments, such as on a platform in the middle of an undulating ocean. There is a wide variety of unconventional oil and gas extraction techniques that have helped squeeze out resources in areas where it would have otherwise been impossible.

Geological risk refers to both the difficulty of extraction and the possibility that the accessible reserves in any deposit will be smaller than estimated. Oil and gas geologists work hard to minimize geological risk by testing frequently, and so it is rare that estimates are substantially "off." In fact, they use the terms "proven," "probable" and "possible" before reserve estimates, to express their level of confidence in the findings.

Price Risk

Beyond the geological risk, the price of oil and gas is the primary factor in deciding whether a reserve is economically feasible. Basically, the higher the geological barriers to easy extraction, the more price risk a given project faces. This is because unconventional extraction usually costs more than a vertical drill down to a deposit.

This doesn't mean that oil and gas companies automatically cease operations on a project that becomes unprofitable due to a price dip. Often, these projects can't be quickly shut down and then restarted. Instead, O&G companies attempt to forecast the likely prices over the term of the project in order to decide whether to begin. Once a project has begun, price risk is a constant companion.

Supply and Demand Risks

Supply and demand shocks are a very real risk for oil and gas companies. As mentioned above, operations take a lot of capital and time to get going, and they are not easy to shut down when prices go south or to ramp up when they go north. The uneven nature of production is part of what makes the price of oil and gas so volatile. Other economic factors also play into this, as financial crises and macroeconomic factors can dry up capital or otherwise affect the industry independently of the usual price risks.

Cost Risks

All of these preceding risks feed into the biggest of them all: operational costs. The more onerous the regulation and the more difficult the drill, the more expensive a project becomes. Couple this with uncertain prices due to worldwide production beyond any one company's control, and you have some real cost concerns.

This is not the end, however, as many oil and gas companies struggle to find and retain the qualified workers that they need during boom times, so payroll can quickly rise to add another

cost to the overall picture. These costs, in turn, have made oil and gas a very capital-intensive industry, with fewer players all the time.

When it comes to oil and gas development with all of its moving parts, an ineffective supply chain management process can lead to worker productivity issues, wasted money and ultimately, lower production levels and profits.

Challenges can creep into any part of the supply chain and create problems with ripple effects, whether it's with delivery of in-bound drilling materials such as mud, water or sand; transporting produced oil or gas from the field to its targeted location; or getting workers to remote locations equipped with supplies not only needed to do their jobs but also needed to sustain life and protect health.

These issues were addressed by DHL in an energy supply chain white paper released this week.

"The global energy industry is undergoing a seismic shift, in part driven by development of new, unconventional sources of energy, such as shale gas, tight oils, coal seam gas and oil sands," according to DHL. "In turn this is requiring logistics executives to rethink traditional energy supply chain models and implement a highly integrated approach to drive down logistics costs and enhance profit margins."

Developers of both conventional and unconventional hydrocarbon resources face challenges, although the type of obstacles vary depending on factors such as location and depth of geological, technical and operational knowledge.

“Supply chains supporting the conventional energy market are still developing as companies have had to expand into ever more inaccessible and remote locations to support the growth in global demand,” said Jonathan Shortish, vice president of the energy sector for Europe, the Middle East and Africa for DHL Customer Solutions & Innovation, in a prepared statement. “In such areas, conventional energy faces the same challenge as unconventional, and that is to establish and maintain a robust infrastructure to support production in undeveloped and/or remote geographies.”

Supply chain challenges identified in the white paper included health, safety, security and environment management; complex operations with multiple stakeholders, lots of drilling and abundant materials; fragmented supply chains that invite disconnects, delays and unclear accountability; frequent plan changes that impact materials demand and service requirements; data management, including end-to-end supply chain visibility and management; materials monitoring; and optimizing purchasing.

But of these issues oil and gas executives put logistical coordination for large projects as well as visibility of materials and predictability working with multiple stakeholders at numerous drilling sites as their top concerns.

To address some of the supply chain issues, some energy companies have opted to stock up on supplies and position them near remote sites, so materials are there when needed. If something isn't readily available, air charter services are utilized, which can become expensive, the white

paper said. But DHL pointed out that this method is “not sustainable, quickly eating into profit margins,” as margins shrink and costs grow.

Building a smarter energy supply chain calls for “a data-driven approach to managing the energy supply chain on a true end-to-end basis,” DHL said, adding that some companies are turning to third-party logistics companies and utilizing a lead logistics provider (LLP) model.

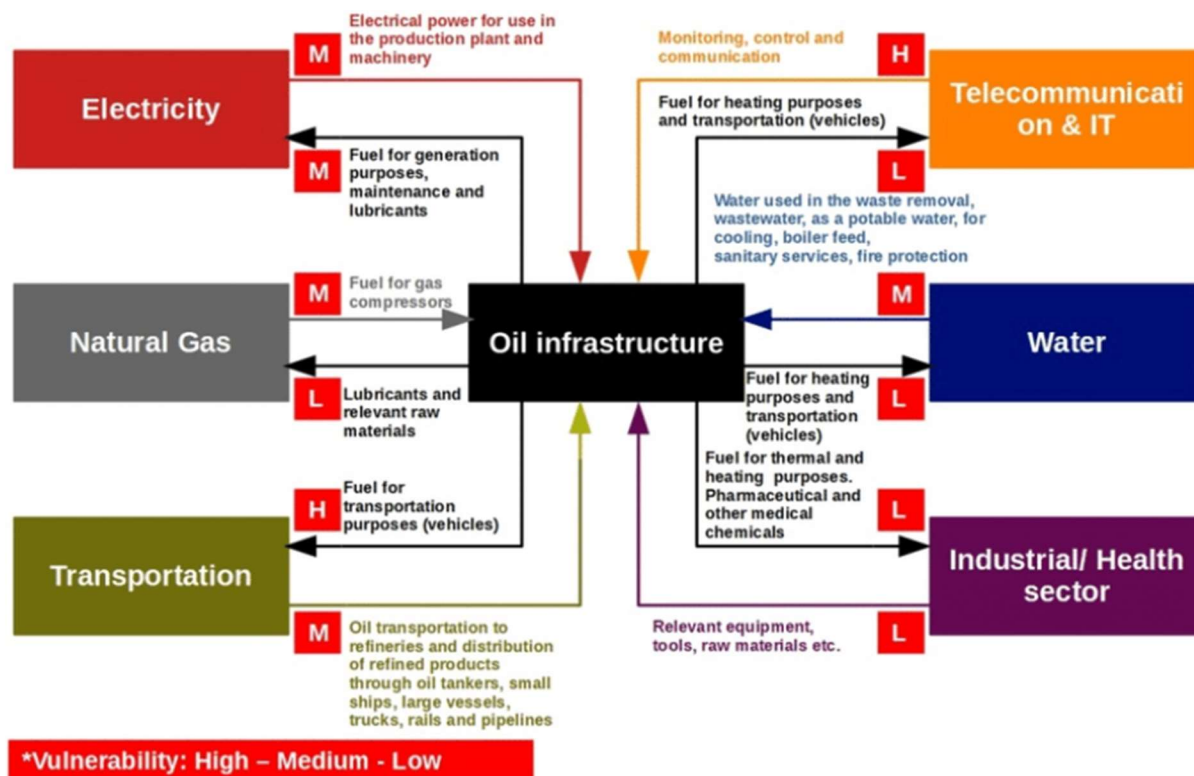
“The LLP sits atop the supply chain hierarchy and orchestrates all in-bound and out-bound logistics. For the in-bound supply chain, for instance, this solution involves management of material from international and domestic suppliers, through origin consolidation hubs and customs clearance, to the in-country primary stock location, consolidation center or cross-dock,” DHL said.

“It also incorporates managing the warehouse and yard. ... The solution layers on information systems that provide full visibility and traceability of materials across the supply chain to all stakeholders, including visibility in remote stock locations. It [also] integrates with the client enterprise resource planning system for accounting and asset management purposes.”

The company is focused on improving third-party logistics operations in China’s Sichuan Basin, working with an international oil company that is drilling in remote areas where there is little local unconventional drilling expertise. Here, the highest perceived risk concerns subcontractor road safety, according to the white paper. The approach includes assessing driver performance, training and equipment condition. In the future, plans are to expand to direct management of

third-party logistics subcontractors, control of other major material groups such as proppants and management of parts of the supply chain.

Shortish added that “the greatest benefit can be realized by setting up the team at the design stage, to formulate the supply chain in parallel with the design stage of the facility, then building the supply chain through the capital expansion phase (construction, commissioning) before ‘flipping’ the supply chain to support the operation expansion phase thereafter.”



STEPS TO MAKE SUPPLY CHAIN MORE RESILIENT

It is important to remember that resilient supply chains are built by design, tailored to the unique needs of every retailer. But for every supply chain to withstand disruption and still meet customer demand, it needs to be agile enough to face unexpected events at any stage, from manufacturing to shipping customer orders.

To prepare your supply chain for the unexpected, here are five strategies that help maintain supply chain resilience.

1. Distribution of inventory across multiple locations

The primary benefit to splitting inventory across multiple fulfillment locations is to expand customer reach geographically while reducing shipping costs and speeding up transit times.

But if a warehouse had to close down for any reason or carriers are unable to pick up, the ability to fulfill items from a secondary distribution center (even its further from the order's destination) can help to avoid long fulfillment delays for important items, so you can continue to meet customer expectations despite having one warehouse shut down.

2. Understand your data

Having real-time supply chain visibility can help build resilience in a number of ways, such as better inventory control, the ability to track supply chain performance, and access to historical inventory and order data.

According to a survey, 21% of supply chain experts consider buffer stock as one of the top three indicators of resiliency. But buffer stock can result in a rise in higher carrying costs, in which case buffer levels have to be carefully planned.

By using data to optimize inventory levels, you can decide how much buffer inventory (also known as safety stock) you can afford to store without cutting into ideal profit margins.

3. Partner with multiple suppliers

Partnering with multiple suppliers or manufacturing options ensures that you are not left at risk or without replenishment when your primary supplier is unable to deliver during shortages, shutdowns, or trade restrictions.

Whether it's a planned shutdown like Chinese New Year or unplanned like forces from the pandemic, manufacturers can hit peak capacity or face shutdowns at any time, which means receiving and replenishing inventory can be significantly delayed, which disrupts the entire supply chain and slows supply chain velocity.

4. Leverage different carriers

As seen during COVID-19 and the rapid expansion of ecommerce, shipping carriers are facing capacity issues, causing major shipping delays. Ship Bob has even been tracking carrier transit time trends since the beginning of the pandemic, which shows major improvements.

By using multiple shipping carriers, you have more shipping flexibility, but partnering with multiple shipping carriers can be a lot of work, and it can also cause you to dip under the minimum shipping threshold to qualify for discounted rates.

5. Rely on logistics experts

Sometimes being too close to the problem can narrow your thinking. To optimize your supply chain and build resilience, you will not only need access to robust supply chain infrastructure and technology, but you will need to hire a knowledgeable logistics staff.

Many ecommerce businesses don't have supply chain or inbound and outbound logistics experts on staff, which can make it difficult to foresee any possible disruptions that can be avoided or planned for ahead of time.

Supply chain analysis and improvement by means of real-world examples

1. Apple

Apple has topped Gartner's Supply Chain Top 25 list for eight years now. CEO Tim Cook has focused on sustainability, strengthening relationships with strategic suppliers, and streamlining inventory management by cutting down on warehousing to limit overstocking. Notably, Tim Cook was a CPO before becoming Apple's CEO.

Apple purchases components and materials from all over the world before sending them to China for assembly. From China, products are shipped directly to customers. Despite its reputation for an "unbreakable" supply chain, Apple has reportedly suffered some setbacks to the iPhone 12 release due to the COVID-19 pandemic.

2. Amazon

Amazon has reinvented eCommerce supply-chain management. The company's focus on high responsiveness combined with warehouse automation and robotics allowed it to transform the industry with one-day delivery, and even offers two-hour delivery with Prime Now.



3. Intel

Intel's recent supply chain data transformation has created a \$208 million "sense-and-respond" platform that simplifies supply chain and data pipelines, provides self-service analysis to enable decision-making, improves data quality, and provides real-time analytics.

In the area of corporate responsibility, Intel's RISE strategy will create a more responsible, inclusive, and sustainable supply chain enabled by technology.

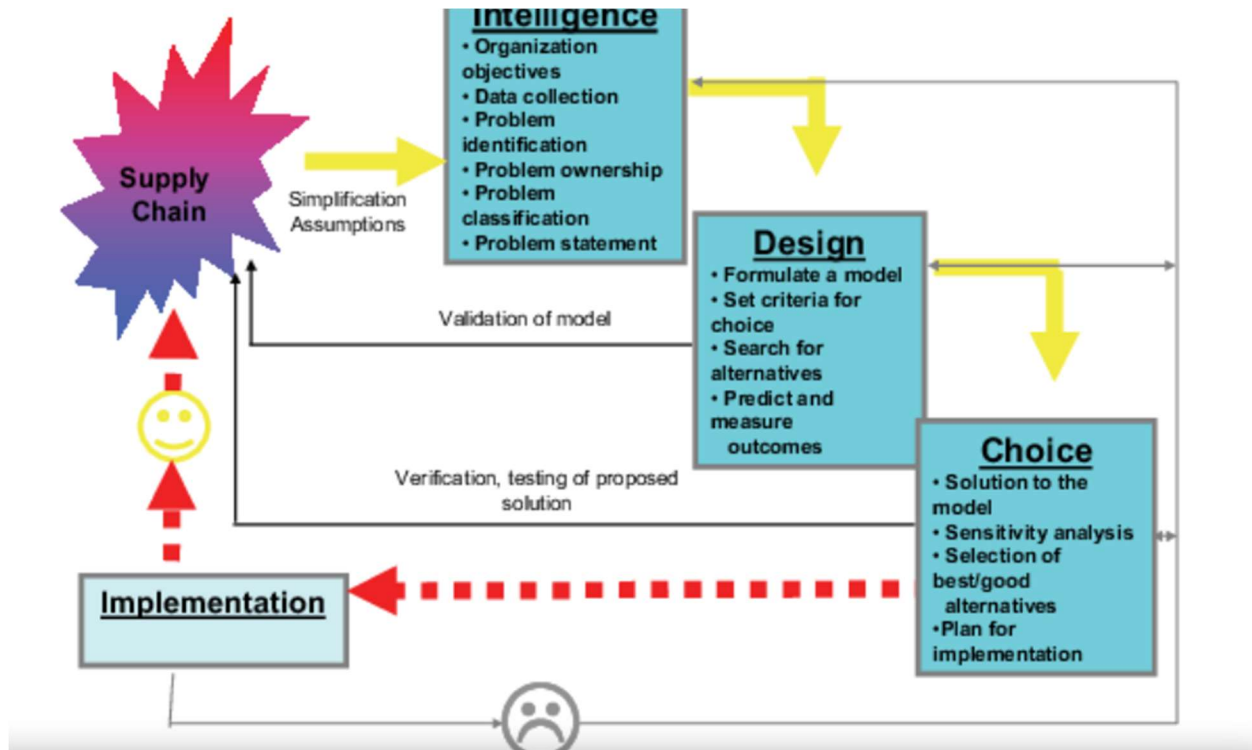
4. Colgate-Palmolive

Consumer products giant Colgate-Palmolive uses its strong supply chain to distribute its brands to more than 200 countries and territories around the world. The company's sustainability efforts have led to the implementation of a supplier code of conduct, the operation of 15 TRUE Zero Waste manufacturing facilities, and other gains in the reduction of GHG emissions. Colgate-Palmolive's recent focus on the streamlining of supplier relationships has led to more efficient product customization.

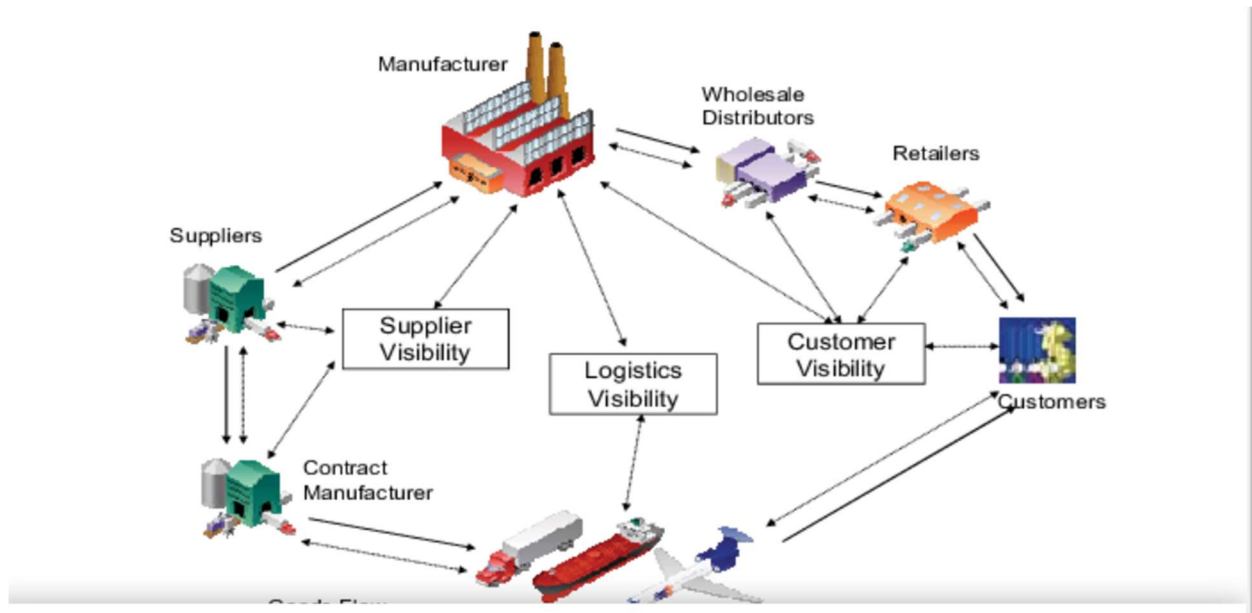
Expanding supply chain visibility

Supply chain visibility (SCV) is the ability to track individual components, sub-assemblies and final products as they travel from supplier to manufacturer to consumer. This data helps companies maneuver around inventory shortages, avoid bottlenecks, meet compliance directives and track products through to delivery.

It is substantial for manufacturing industries to enforce and seek out new strategies regarding supply chain management to endure within the current competitive and capricious business climate which is critical. We try to underlie a policy for manufacturers to connect all operational issues related to the supply chain. This chapter suggests a concept of visibility that represents a beneficial role among business partners such as manufacturers, supplier, and customers. The categorization



of several types for uncertainties in the supply chain such as demand, quality, broader variety, time, and customization of a product are related to the decision-maker. Management of uncertainties applicable with the help of sharing the information creates visibility among supply chain partners. Implementing supply chain visibility becomes easier just because of passing information about products globally which is more a matter of priorities and investment, which is not the case when sharing "official data" about people. As social technologies become more prominent, this may change over time. So, supply chain visibility is beneficial for supply chain partners.



RECOMENDATIONS

overall performance can be improved through effective matching of what is produced, when it is produced and the quantities to be produced to the specific customer requirement. Understanding the “total value” of major spend categories will also improve supply chain, this requires thoroughly identifying cost and option across the supply chain for each category and determine appropriate interventions (e.g., seeking new suppliers, changing specifications, altering contract terms)

Relationship management is a 2-way traffic in oil & gas industry. This oil & gas industry is involved in a global supply chain that involves domestic and international transportation, value-chain strategic warehouse management, order and inventory visibility and control, materials handling, import/export facilitation, and information technology. This means in effect that the shipper and the oil companies are jointly and mutually involve and intertwined with each other, end-to-end in transportation management from the moment an order is placed by the vendor to the day it is unloaded.

strategic sourcing implies that suppliers who have consistently demonstrated superior performance deserve a favorable status, including customer loyalty and preferential treatment. Therefore, one method for improving a supply chain is to select an excellent corps of suppliers.

Communication with your suppliers is key! When you have a good relationship with your suppliers, you can plan better and avoid any shortages, delays, or issues early on.

A dependable supplier is responsible for tracking the work-in-process inventory phase (i.e., the movement of raw materials being processed into finished goods), which impacts the quality of the products you sell and how quickly you can obtain more inventory.

Suppliers that are inconsistent in delivering a quality product can slow down your supply from the very beginning, so it's important to be selective and weed out suppliers that are consistently causing issues or delays to your sourcing.

Once you have discovered suppliers that are both responsible and flexible, you'll need to continually foster those relationships through clear and open communication and conflict resolution.

Finding ways to automate supply chain processes is one of the best ways to improve efficiency, reduce human error, increase supply chain performance and velocity, and save time and money in the long run.

Automating time-consuming tasks, from order processing to automated shipping, doesn't necessarily replace the need for human effort, but it does help you streamline your operations and increase productivity.

Warehouse automation reduces the time, effort, and errors that are common in logistics. Some business owners even employ logistics automation in their own warehouse, using their own technology and tools.

With so many processes taking place simultaneously across your supply chain, it's important to use implement the right software and technology that allows your team to work as efficiently as possible.

If you manage a warehouse inventory across locations, you might want to consider using a warehouse management system (WMS) that connects with your IMS, which can help you automate order processing, get real-time inventory tracking, order management tools, and data reporting and analytics.

It's important to continuously collect and analyze warehouse inventory management performance to identify areas of improvement where further efficiency and higher order accuracy can be achieved. This can be done by investing in technology, automating processes, or hiring logistics experts to help.

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