

The Impact of Supply Chain Imbalances on the Defense Industry

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ABSTRACT: Supply chain is a critical network in today's economy to ensure that manufacturers and other businesses make the most of their profits. In a volatile market environment, companies must be concerned about the flow of goods. This is especially true in light of the Covid-19 pandemic, which was triggered by the outbreak of violence between Russia and Ukraine. The war also brought sanctions against Russia, which severely impacted the defense industry supply chain. The article examines the current state of the global supply chains during wartime, while also discussing management implications and suggestions for improving the supply systems, such as with blockchain technology. This research is based on information analysis of the current global supply chain and aims to propose solutions to reduce the risk for the defence industry.

KEYWORDS: supply chain, defence industry, military, war, blockchain

Introduction

Five functions are common to military logistics: maintenance and repair, supply, transport and movements, maintenance, repair and medical services. Three basic options exist for military logistics: get the resources on the battlefield, transport the resources to the front area, or transport the resources

from the rear to the troops on the battlefield. Logistical considerations have influenced military operations throughout history.

Modern military logistics must include all three options. The first option is to be partially dependent on the host nation's support. The second option is partially used by armies that bring supplies to the units. However, this third option is the only one that can sustain a modern military unit for a long time. No matter what mission, armies cannot accomplish their tasks in time if there is no logistical function that guarantees a steady flow of resources at the right speed and time.

Defence supply networks, also known as defence supply chains, are responsible for distributing different types of supplies. These supply chains can include a variety of suppliers and in-house storage facilities to many types of military units. They must also distribute these types of supplies in multiple domains and situations, satisfying multiple operational needs. Each nation's armed forces are dependent on many different supplies, while different countries and organizations have different methods of classifying the supplies.

The production of the force structure and the maintenance of readiness, modernization, and sustainability are all dependent on military logistics. The operational requirements for readiness and sustainability in military logistics have their own meanings that differ from those used elsewhere, but even so there is no universally accepted terminology or definition in this area.

Methodology

This study was qualitative in nature and aimed to examine the Defense Industry Supply Chain. An interpretive approach was used as part of the qualitative research design to identify key attributes of supply chains, the defense industry, and the use blockchain technology to improve supply-chain systems and increase their security. Interpretive research requires that the researcher understands the subjective meaning of phenomena and social action.

Results and discussions

Defense industry supply chain

Due to the complexity of most weapon systems supply chains, some components require parts from fifth- or fourth-level suppliers, disruptions

are possible. A supply chain is a collection of activities that distributors and manufacturers must do to create value, including purchasing, manufacturing, and distribution. A supply chain solution is composed of both a supply strategy (manufacturing strategy) and a delivery strategy (delivery strategy) that reflect the capabilities of the delivery system.

Researchers suggest a range of contingency variables that are business characteristics that can influence the competitive priorities supply chains should follow to maximize profit. The five key characteristics of supply chains include the duration of lifecycles, delivery lead-times, volume, product variety and variability in demand, supply, or process.

A company must focus on the end-user when it is involved in a supply chain. This includes service, quality and cost, as well as quality, flexibility and innovation. These competitive priorities are a key element of supply chain strategy that is aiming to outline how a company can achieve competitive advantage through its competitive priorities (Hutchings 2022, 7).

The US Government Accountability Office highlighted several problems with the F-35 supply chains, including lack of spare parts, limited repair capability, mismatched parts for aircraft deployment, and an immature global network to transport parts. Contractors have a hard time retrofitting or upgrading older assets, such as the US Army's basic M1A1 Abrams Tank Platform, dating from 1970s. It has seen many modifications and upgrades, including new weapons, armour, and drivetrains. Multiple variants can be used by different units, making it difficult to ensure the right part is in the right place at the right moment. If any of these elements go wrong, it can lead to production delays, downtime, asset damage, and a reduction in readiness.

The central challenge for defense supply chains is to put more emphasis on supplier risk management. In this regard, multiple layers of vendors and sub-suppliers are required to develop complex platforms (Blokdyk 2017, 35-36).

The impact of the war between Russia and Ukraine on supply chains

Supply chains are being tested again after the effects of Covid-19. This time, it is the conflict in Ukraine. Organizations must build resilience in their supply chains to survive conflict, due to the fact that many are attempting to reduce dependence on Russia and East Europe for raw material, migrating instead to more localized or regional sourcing strategies (Jagtap 2022, 5-6).

The direct effect on the supply chain was the sharp rise of commodity prices, including petrol, diesel and other fuels. This has had a devastating impact on companies around the globe, which are now being forced to seek out alternative materials and labor sources in order to meet demand (Garicano 2022, 109-112).

The global commodity prices are rising

As we have seen, commodities prices have experienced a massive spike due to rising inflation and supply disruptions. Inflationary effects from the Ukraine conflict will likely continue to impact costs of raw materials and energy as well as logistics and digital services. Due to Russia's dependence on oil imports, which account for 40% of Europe's gas, oil and gas prices have already risen across the globe.

Recent reports indicate that the continued rise in energy prices is having a negative effect on the eurozone's economy, which has primarily resulted in a slowing growth rate. A delayed and indirect impact on resins/petrochemicals can also be expected due to the rising costs of upstream resources (crude and natural gas), which could cause logistical disruptions. However, energy is not the only industry that will be affected by these price increases. All key metals like copper, nickel, platinum and nickel are expected to be affected along with all the industries that are using these materials (Wilson 2022).

Organizations are searching for other sources of supply

Companies around the world are being forced to look for cheaper sources of materials due to rapid inflation. This could lead to a decrease in the supply of important grains like wheat and corn, and a rise in the prices of bread and other products. Russia is also the largest exporter of all three major fertilizer groups, which can cause an increase in input costs. If alternatives are not found quickly, this could result in a food crisis for major importing countries, such as the Middle East or North Africa.

We expect further disruptions in the supply of metals and plastics as well as semiconductor chips. This will have an impact on the production of medical devices. Russia is a major player in the mining and processing of palladium (45%), and platinum (15%). Possible international trade sanctions from the EU and the US against Russia will likely disrupt the exports of these

metals. We see a shift towards raw materials coming from Asia and Africa as a result of these shortages, but while some changes may be permanent, it is unlikely that they will change in the near to medium term. There will be new markets and new sources for raw materials, but their availability and price may be limited.

Labour shortages

Businesses are under increasing pressure to source alternative materials and find more labour. There has been a reduction in the supply of labour in Eastern Europe since the conflict started, which has led to increased costs. According to International Chamber of Shipping data, Russians make up 10.5% (198,123), while Ukraine makes up 76,442 or 4%. Many companies are exploring South America and Africa as options for labor-intensive jobs that require a lot of people to move away from Eastern Europe. This is especially important for agriculture and farming industries, which depend on short-term foreign workers to harvest crops.

Import and production disruption

Both global supply and demand have been severely affected since 2020, resulting in supply chain shortages. The demand for goods from Asia has increased, especially in advanced economies, while the supply sector has been affected by the closure of Chinese factories and the shortage of labor in ports of importing nations, which have caused significant delays and made it difficult to find transportation ships.

Major Western ports reported large backlogs and stranded containers, which in turn contributed to the shortage of containers. All areas of logistics movement, including ocean freight, rail freight and airlines, have been disrupted by the war. The disruption of the last mile of the supply chain can also be expected - an area already severely affected by recent fuel and driver shortages and the pandemic.

Businesses will need greater transparency about planned transport, capacity, and alternative routes in order to limit disruption, and in order to ensure that there are no further obstacles, it is important to establish strategic relationships and join alliances. Businesses cannot afford to rely upon outdated information in these times of volatility and constant change.

Risk management has become mandatory

All of the above-mentioned trends - logistics disruption, cost, alternative sourcing and labor shortages - point to our fifth and final trend - greater risk management. This crisis has brought to light the importance of improving visibility, and this is why organizations must improve visibility of supply chains, as risk is often hidden by sub-tier suppliers.

Although it may seem obvious to ask questions like “Who are our suppliers?” or “Where do our critical materials come from?” organisations need to have visibility and an understanding of the potential risks in order to be able to respond to and adapt to any disruption. The supply chain managers will focus on building resilience in the operations of their business. This starts with preparation and visibility. In fact, organizations will move away from Just In-Time (JIT), inventory management to Just In-Case (JIC) inventory management. In-country supply and regionalization are becoming more attractive options for the safety, security and stability they provide.

The worst-case scenario is a war that extends into 2023, since this could have a long-lasting impact with 2.8% GDP growth in Europe slashed from pre-war expectations to bottom at 1.1% next year. Inflation could rise sharply beyond 10% and then fall in 2023. This scenario could lead to a larger oil and gas embargo, which would cause structural disruption and commodity prices remaining high and volatile through 2023. Consumer spending would be affected by price increases, which could lead to a drop in confidence and a decrease in growth. There will be varying times and costs involved in addressing supply chain problems, while preliminary easements suggest that it could take up to EUR 920 billion to fix the current disruptions.

European growth is driven by supply chains, but operating models aren't ready for uncertainty. The Ukraine-Russia crisis will have a significant effect as we see more disruptions over time; each scenario will need to be evaluated, but all will require a fundamental supply chain redesign around security of supply and energy transition, as well as agility to address the new economic landscape.

Real-time, end-to-end visibility across the entire extended supply chain is essential for resilience. Control towers are a great help. Analytics and data can speed decision-making, increasing competitiveness and boosting efficiency. Frontrunners create digital twins of supply chain to test their responses, while the endeavor to prepare for unanticipated risks will determine companies to

shift from a just in time approach to one that is just in case. This includes diversifying supply bases, creating alternative freight routes, building inventory, and making distribution centers more flexible. This ‘insurance policy’ is not cheap, but it makes sense in times of uncertainty. To address a paradigm shift, supply chains must be redesigned. Originally, supply chains were created to maximize costs. In today’s world they need to be more resilient and flexible to deal with increasing supply uncertainty. They also have to become a competitive advantage that will allow future growth.

Future-ready supply chains are essential to capture growth opportunities, but they must be relevant and enable customer-centric experiences. Organizations can better fulfill customer expectations by moving away from linear, centralized supply models to decentralized networks that use production on-demand. In some cases, this may even mean bringing production closer the point of sale. This means they have to demonstrate a commitment towards addressing environmental and social problems, as well as bolstering the efforts of partners to improve sustainability throughout the product’s lifetime. Trust will only be built if there is transparency (Kilpatrick 2022, 5).

It is important to invest in cutting-edge technology that will enable resilient, relevant and sustainable supply chains, including digital twins, analytics and control tower algorithms. Cloud computing will be crucial, as it provides enormous computing power in a cost-effective way that is flexible and sustainable. A new economic order is needed amid an inflationary environment and tight talent markets.

The advantages of integrating blockchain technology in supply chain management

Blockchain is a distributed and decentralized digital ledger that records transactions and facilitates asset tracking within the business network. Blockchain can also prevent the replacement of genuine product with counterfeit products. Blockchain in Supply Chain Management also has other benefits, such as transparency and traceability.

Few military defenses are currently exploring blockchain’s potential in security and defense to maximize its capabilities and capacity in terms of actions, assets, and operations. A few potential uses of military blockchain include tracking defense shipments/contracts, secure government messaging and

battlefield messaging, cyber warfare readiness, preventing data theft and NATO applications, protecting weapons systems, and military additive manufacturing.

Original equipment manufacturers can use blockchain technology to support them as they move from traditional procurement models to sustainment arrangements. In these arrangements, they don't sell assets, but rather sell capabilities. An original equipment manufacturer could, for example, sell airborne fuel tanks instead of selling them. Private contractor operations are increasingly looking into space commands. These agreements are growing in popularity, but they shift operational risk from military to original equipment manufacturers that retain control of the asset (Anand 2022, 3-4).

Blockchain allows for transparency and insight to link production and operation. With a single set data, manufacturers can meet not only delivery targets but also operational requirements. This technology allows original equipment manufacturers to deliver better service and improve their financial performance through these types of contracts (Szewczyk 2019, 593-596).

As part of routine maintenance checks, all platforms and systems used by the armed forces must be inspected periodically. Having greater visibility into the state and use of every part, which is distributed to all nodes in the supply chain could greatly improve the efficiency and speed with which these checks can be completed. Instead of reactive maintenance, which is when a part breaks down, prescriptive maintenance could be used to predict when it will break down. The asset could be powered by AI and ML and link to original equipment suppliers and manufacturers, allowing it to request the part ahead of time. This would enable maintenance units to keep smaller parts inventories (Wang 2020, 3-4).

Conclusions

The global COVID-19 pandemic has shown that fragile supply chains can have long-lasting and far-reaching consequences for economic prosperity and national security. A supply chain system typically includes a number of companies and various types of flow, including information, finance, and goods. The paper suggested that blockchain could facilitate supply chain integration and collaboration. Additionally, blockchain applications, including information sharing, traceability, and automation, can facilitate supply chain collaboration. We also considered the potential of blockchain technology in terms of its transparency, immutability, speed, security, and transparency.

Another wake-up call is the war between Russia and Ukraine. This shows how important it is to increase resilience of supply chains. In today's complex, globalized, and asymmetric security environment, national defense faces many challenges that require a comprehensive foreign and security policy. This requires a new management approach and a greater collaboration among all relevant organizations, governmental and not. To further protect national defense, it is important to implement safety-and security-related tools.

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