3YOURMIND

Manufacturing the Future

Driving Agility, Transparency, and Innovation in the Defense Industry

August 2025

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Introduction

The theater of war has undergone significant changes. However, much of our industrial strategy is still rooted in lessons from the Second World War.

In the 1940s, America and its allies converted traditional factories into a powerful defense manufacturing arsenal that would ultimately turn the tide of the war. This rapid mobilization of a domestic industrial base was the key to victory.

Today, we face a new kind of challenge. Our globalized supply chains, built for efficiency and cheap goods, are now a source of fragility. Decades of diminished domestic manufacturing have left us with an industrial base that is unprepared for a major conflict.

This is the core problem we must solve: How do we fortify our dispersed and fragile supply chains to support both a thriving economy in times of peace and a robust defense in times of conflict?

To answer this, we must look to the past, not to copy the playbook of famous industrialists of yesteryear, but to embody their boldness and innovation.

We will explore how a mobilized industrial base can be adapted to the modern era, leveraging new technologies and a deeper understanding of our globalized economy.

This is not about reviving the past, but about using its lessons to build a stronger, more resilient industrial foundation for the next generation of warfare—a future defined by speed, data, and decentralized production.

Alexandre Donnadieu works with defense organizations to implement solutions that reinforce supply chains.

The State of Innovation in Defense:
Meeting the Demands of Modern Warfare

The defense industry, a historical pillar of national security, now finds itself in an urgent race for rapid innovation. While technological advances accelerate globally, the defense sector's pace of adoption has lagged, a vulnerability starkly exposed by the ongoing conflict in Ukraine.

The war has shed a harsh spotlight on the deficiencies of rigid procurement systems and how these outdated operational models reveal a glaring disconnect between the rapidly evolving needs of warfighters and the slow-moving industrial base.

Ukraine offers not just a warning of what could happen if the status quo were to continue; it also offers an opportunity to course correct. The lessons learned in Ukraine offer a blueprint supported by a story of resilience. In our efforts to support the Ukrainian Armed Forces (AFU), we've learned a great deal, not only about where innovation has occurred and how to replicate it, but also about the critical needs that still exist.

To close the gap, the defense industry must address four core challenges and implement solutions that anticipate the needs of future conflicts:
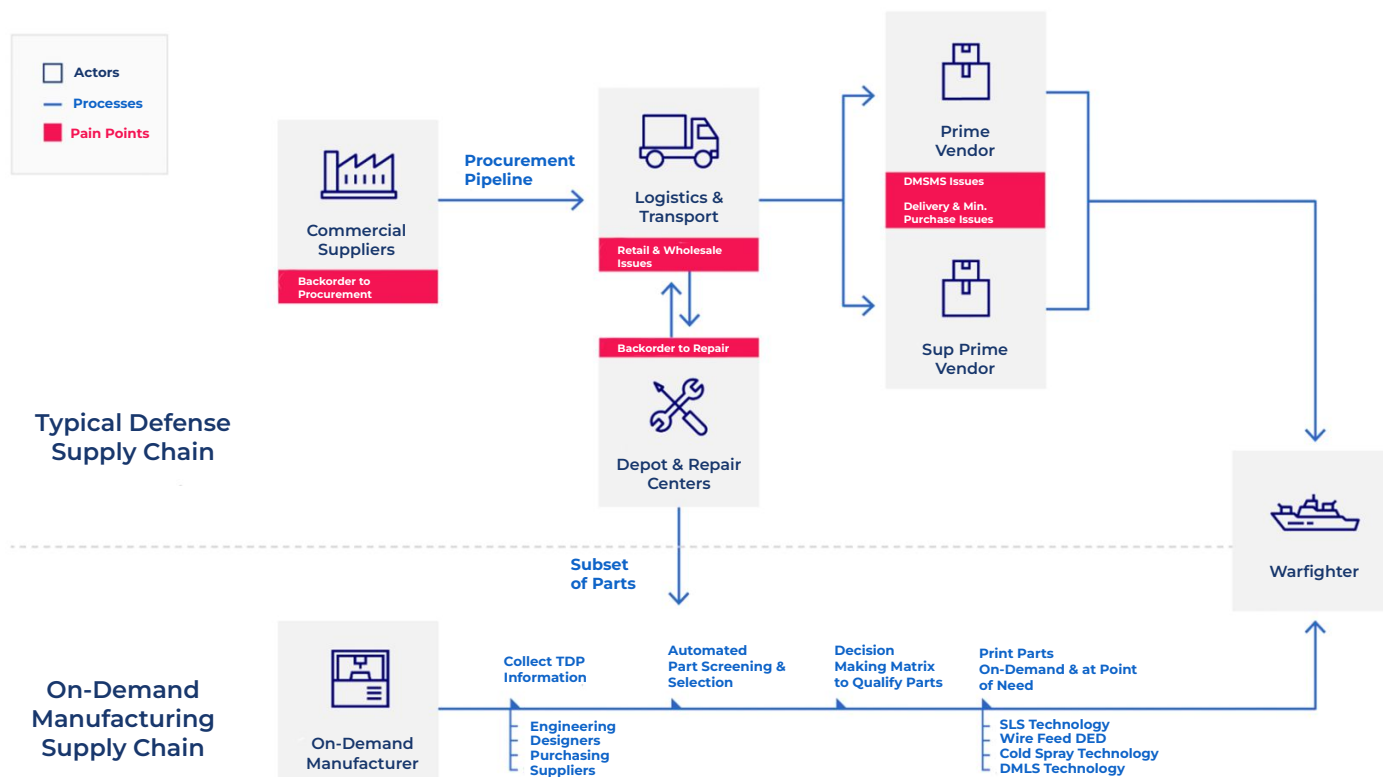
1. Bypassing Procurement Bottlenecks with On-Demand Manufacturing

The traditional defense procurement process is notoriously slow and inflexible. The prime contractor model, while effective for large-scale projects, becomes a critical bottleneck when speed and adaptability are paramount. Warfighters in the field shouldn't have to wait months for a replacement part due to a fragmented supply chain.

Challenges Overview:

1. Procurement Bottlenecks

2. Fragmented Supply Chains

3. Slow Feedback Loops

4. Addressing Service Shortages

Typical Defense Supply Chain

- Actors
- Processes
- Pain Points

Commercial Suppliers — Backorder to Procurement

Procurement Pipeline

Logistics & Transport — Retail & Wholesale Issues

Backorder to Repair

Depot & Repair Centers

Prime Vendor — DMSMS Issues — Delivery & Min. Purchase Issues

Sup Prime Vendor

Warfighter

On-Demand Manufacturing Supply Chain

On-Demand Manufacturer

Subset of Parts

Collect TDP Information
- Engineering Designers
- Purchasing Suppliers

Automated Part Screening & Selection

Decision Making Matrix to Qualify Parts

Print Parts On-Demand & at Point of Need
- SLS Technology
- Wire Feed DED
- Cold Spray Technology
- DMLS Technology

Advanced manufacturing methods utilize digital transformation to reinforce and de-risk supply chains.

This is where advanced manufacturing technologies, like 3D printing, offer a powerful solution. By enabling the creation of spare parts on demand, organizations can bypass traditional logistics and meet urgent, real-time needs.

In Ukraine, this is already happening: the military has successfully used 3D printing to produce critical components, from simple tow hooks to mission-essential firing pins. By adopting on-demand manufacturing, defense organizations can become more agile, ensuring the right parts are always available when and where they are needed.

2. Building Resilient Supply Chains with Digital Transformation

Beyond procurement, the defense industrial base is hampered by outdated skill sets, a reliance on physical stock, and global supply chains that are highly vulnerable to geopolitical instability and trade barriers. These factors have eroded industrial competitiveness, leaving organizations vulnerable.

The solution lies in embracing a digital-first approach.

By digitizing part inventories and implementing automation, defense organizations can reduce their reliance on physical stock and improve overall supply chain efficiency.

This digital transformation provides the transparency needed to proactively identify vulnerabilities and mitigate risks, ensuring that expertise and resources are available even in the face of disruption. This not only builds a more resilient supply chain but also prepares the workforce with the modern skills required for future conflicts.

3. Closing the Feedback Loop with AI and Data

The most significant operational challenge is the slow feedback loop between the warfighter's needs and the industrial response. This disconnect leads to delays in providing the right equipment at the right time, hindering operational effectiveness and putting lives at risk.

Integrating AI-powered tools is the key to accelerating decision-making and bridging this gap. By centralizing data and creating digital inventories, defense organizations can move away from slow, fragmented processes.

For instance, tools like 3YOURMIND's Part Identification can assess parts for on-demand manufacturing potential in seconds, not hours, using little more than technical drawings or select data points. This direct, data-driven link between the front line and the industrial base ensures that procurement and production are aligned directly with the warfighter's most pressing needs. The result is a more responsive, resilient model that dramatically improves operational effectiveness.

4. Providing Services, Not Just Technology

One of the major lessons learned from the war in Ukraine is that there's a chasm to be crossed between support and service. The U.S. and NATO have invested upwards of $125 billion (as of EOY2024) in providing military equipment to aid Ukraine's defense. M113 armored personnel carriers, M777 howitzers, and ATACMS ballistic missiles are just a few examples of equipment that have been donated to Ukraine's cause.

But there's a fatal flaw.

Equipment without support or service to maintain and repair it is little more than an expensive paperweight. We need to reimagine defense manufacturing less in terms of 'units sold' and more in terms of services provided. Our work in Ukraine has revealed that this is a crucial need. Although many companies want to bring their technology and equipment to Ukraine, without the necessary service and support to operate that equipment, they fail to advance the cause.

Instead, integrated manufacturing services that close the interoperability loop by providing resources like technicians to service equipment, software to manage operations, and data to inform decisions will have a competitive advantage in the next chapter of defense manufacturing.

The Path Forward

The challenges facing defense innovation are significant but not insurmountable. The path forward is clear, but requires adaptability, agility, and, most importantly, intention. In the next section, we'll discuss four pillars for making the vision of the factory of the future a reality.

Percentage of government support to Ukraine by country

The U.S. has contributed

42.7%

of total government support to Ukraine
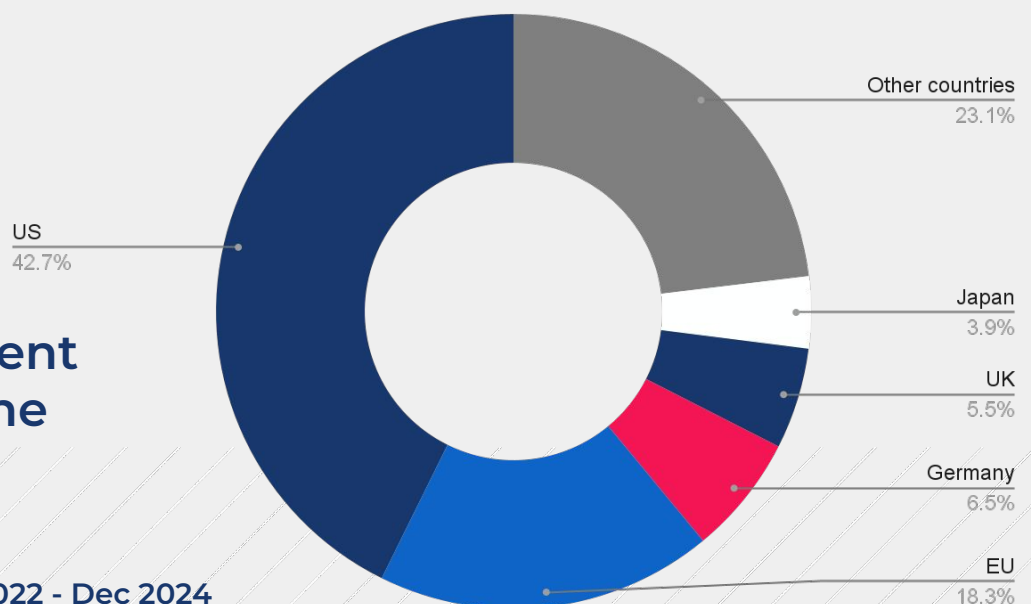
Source: Kiel Institute, Jan 2022 - Dec 2024

US
42.7%

Other countries
23.1%

Japan
3.9%

UK
5.5%

Germany
6.5%

EU
18.3%

A Path to Adaptation and Efficiency:
The Vision for the Future of Industry

As the world accelerates into a new era of technological complexity, industry must evolve with the same agility and strategic thinking that drives today's most sophisticated operations.

The factory floor now faces challenges that demand adaptability, real-time insights, and a level of interoperability that was once the hallmark of high-stakes environments.

To meet these demands, we must reimagine the industrial landscape. Here are four key vision pillars that will drive the next generation of manufacturing excellence:

A Unified Operating System for Industry

The Vision: Imagine a command and control system—but for your entire factory and supply chain. This system would seamlessly connect field data, engineering, production, and feedback, enabling real-time, data-driven decision-making. In a complex, data-rich environment, leaders can only make informed choices by accessing a wide array of unified data sources. The same principle must apply to industry.

The Challenge: Many factories currently operate in silos, with data separated across disconnected systems. Feedback arrives too late, or not at all, resulting in adjustments to production processes that are reactive rather than proactive. This fragmentation makes it nearly impossible to respond to market shifts with the speed required to stay competitive.

The Solution: To create an efficient and agile manufacturing environment, we must design a unified operating system that integrates data flows and decision-making processes.

Key Pillars

1. All-Domain Operating System

2. Interoperability by Design

3. AI as a Strategic Lever

4. Adaptive and Dual-Use

This system must integrate feedback and insights in real-time—not weeks or months later—so that lessons learned from the field can be acted upon immediately. This approach ensures production stays ahead of demand and adapts proactively to evolving challenges.

Interoperability by Design

The Vision: Just as modern systems rely on interoperability to communicate across different platforms, manufacturing must embrace it as a core design principle. Whether it's data standards, machine connectivity, or software integrations, everything must "speak the same language."

The Challenge: The lack of universal data standards and communication protocols means that many systems within a factory—or across a supply chain—are often incompatible. This leads to inefficiencies, costly integrations, and missed opportunities for optimization.

The Solution: To truly unlock the power of a connected, digital manufacturing ecosystem, the industry needs to standardize its data and communication protocols. Machines, software, and data must be interoperable by design, enabling seamless collaboration across various facilities, suppliers, and sectors. This requires the adoption of common data standards and ontologies that will allow everything to connect and share information in real-time.

*AI can analyze technical drawings from spare parts and assemblies to digitize inventories faster.*
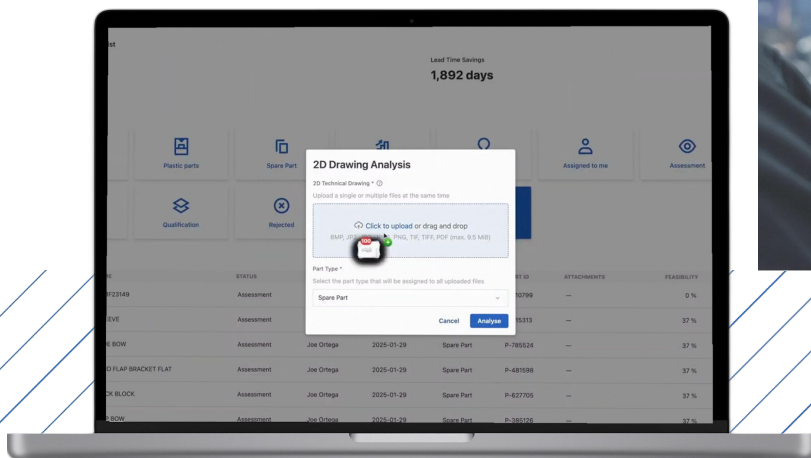
AI as a Strategic Lever

The Vision: In today's most complex environments, AI is used to analyze vast amounts of data, predict outcomes, and optimize performance. In industry, AI can be just as transformative. It can help us understand patterns, predict needs before they emerge, and automate complex decision-making processes.

The Challenge: Many manufacturers have access to large datasets but lack the tools and expertise to extract meaningful insights. Data is often unstructured or not properly contextualized, making it difficult to use for predictive analysis or to automate key processes.

The Solution: By implementing AI-powered platforms, manufacturers can automate data analysis, predict maintenance needs, optimize production schedules, and identify quality control issues before they escalate. AI acts as a smart layer on top of a unified operating system, turning raw data into actionable intelligence and unlocking massive gains in efficiency and foresight.
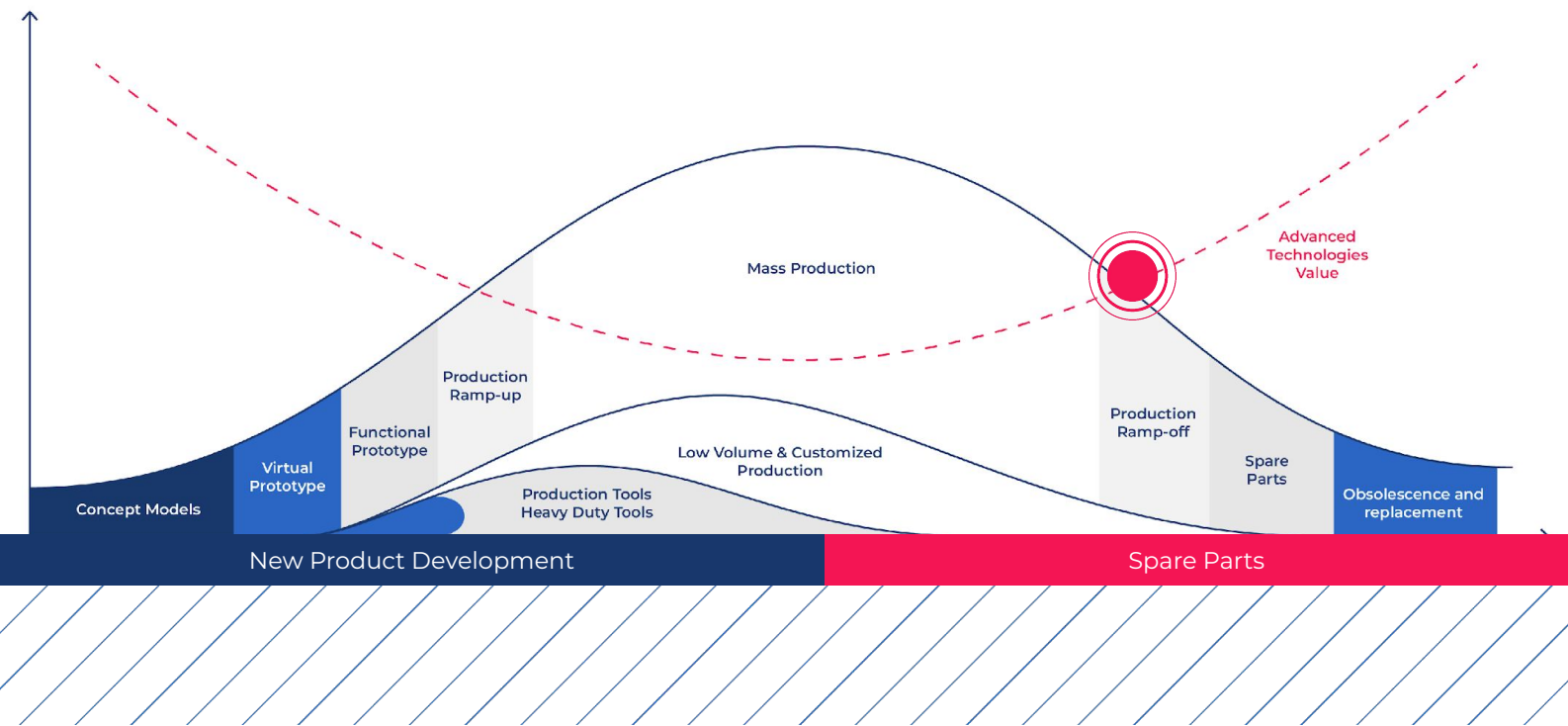
Advanced manufacturing methods like 3D printing are adaptive and can more easily respond to warfighter demand.

Adaptive and Reconfigurable Manufacturing

The Vision: Think of an operational environment where flexibility, modularity, and adaptability are paramount. Factories should function the same way—able to quickly adjust to changing demands, resources, and technologies. Versatility is no longer just a nice-to-have; it is the new currency of readiness.

The Challenge: In today's manufacturing landscape, many factories are designed for a specific purpose and are often ill-equipped to pivot or reconfigure in response to changing market demands or production requirements. This rigidity makes them vulnerable to supply chain disruptions and shifts in consumer needs.

The Solution: Factories must be designed to be modular, reconfigurable, and multi-mission. This approach enables manufacturers to be more agile in the face of changing conditions, allowing them to scale operations up or down as needed and adapt their facilities to new demands—whether it's shifting production lines, introducing new products, or responding to urgent market needs.

A Future Built on Agility and Connection

The journey toward a more agile and resilient industrial future begins with a fundamental shift in mindset. The principles of transparency, interoperability, data-driven insights, and adaptability are no longer abstract ideas—they are the core pillars of competitive excellence.

By embracing a unified operating system, designing for seamless communication, leveraging AI as a strategic asset, and building reconfigurable facilities, manufacturers can move beyond reactive problem-solving to proactive, data-driven solutions. This isn't just about adopting new technology; it's about building a foundation that can withstand a new era of complexity and lead with confidence.

Final Thoughts

The industrial landscape is at a crossroads. The lessons from the past, built on a foundation of mobilization and resilience, are more relevant than ever. But to truly honor that legacy, we must do more than look back—we must look forward. The path to a more robust, agile, and competitive industrial future lies in embracing the principles of digital transformation, interoperability, and data-driven decision-making.

The challenges are clear, but so are the opportunities. By unifying fragmented systems, building resilient supply chains, and empowering teams with real-time visibility, we can forge a new era of industrial might. This isn't a theoretical exercise; it's an urgent call to action.

Ready to Build a More Resilient Future?

The future of manufacturing is here. It's transparent, connected, and ready to adapt. If you're ready to explore how these principles can be applied to your organization, we're here to help you get started

For more information about our work, visit www.3yourmind.com

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"Until this point we've been very much reactive.

Now, using software, we can identify problems and start addressing issues, which makes us more proactive."

Douglas McCue

AM Program Analyst at U.S. Marine Corps. Advanced Manufacturing Systems

3YOURMIND

3YOURMIND's on-demand manufacturing software helps you get the parts you need in the right place at the right time.

Request an onboarding call with one of our experts to get started.

Schedule Onboarding

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EUROPEAN UNION

European Regional
Development Fund