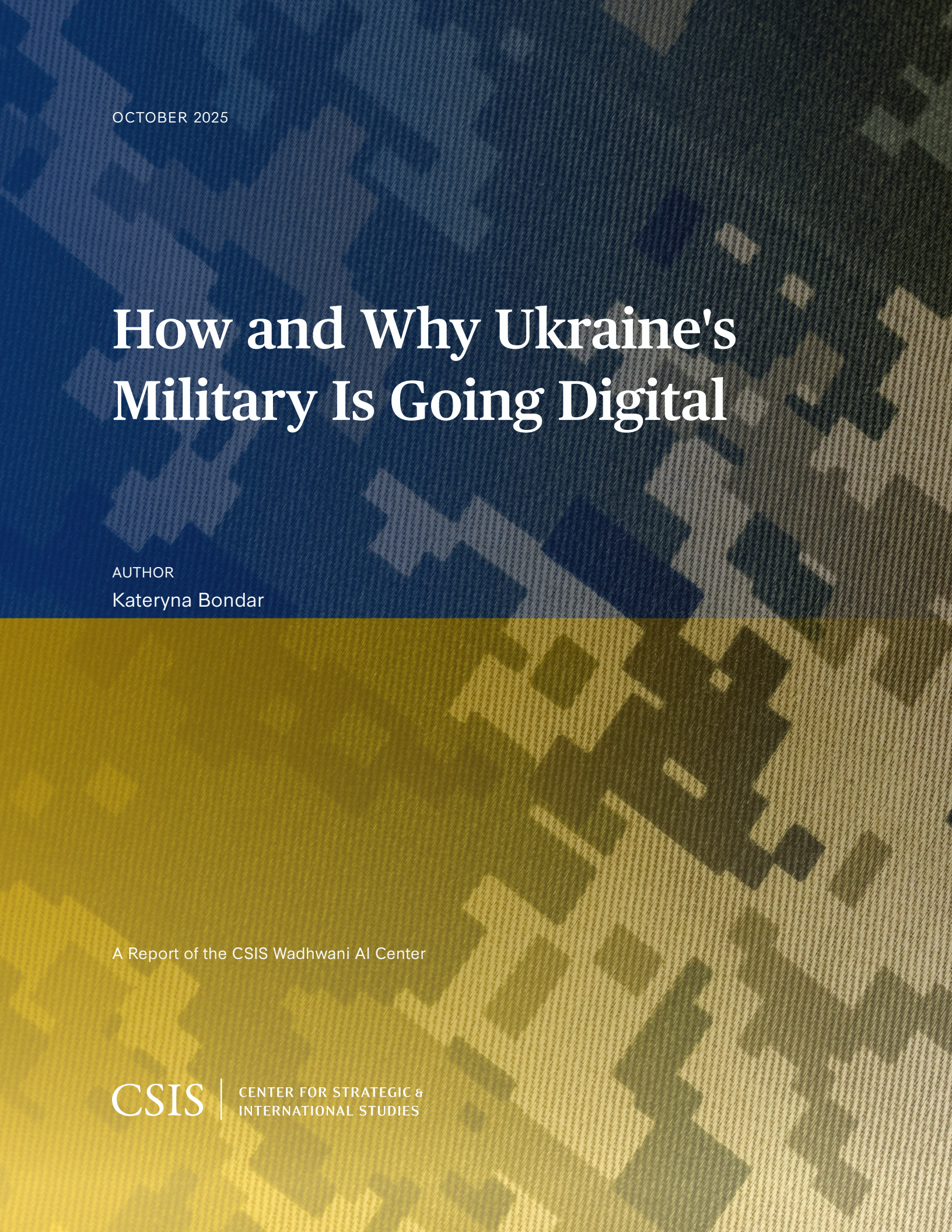

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How and Why Ukraine's Military Is Going Digital

AUTHOR
Kateryna Bondar

A Report of the CSIS Wadhwani AI Center

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Introduction

Three years into the largest war on European soil since World War II, the Russian invasion of Ukraine has become a testing ground for how modern military systems evolve under relentless pressure.

Though each side of the conflict draws on inherited Soviet-era defense structures, they have diverged in how they adapt to the demands of modern war. Both Russia and Ukraine now operate hybrid defense ecosystems shaped by a combination of legacy industrial capacity, newly emergent innovation, and the various pathways to integrating commercial technologies into military use. However, their approaches to institutional adaptation, technological integration, and the organization of warfighting capabilities differ substantially. These differences offer a valuable lens into how military governance systems evolve under the pressures of large-scale, high-tech warfare, and they provide lessons for peacetime militaries seeking to prepare for the future of conflict.

While Russia's approach remains largely consistent with its Soviet-era centralized model familiar from Cold War military governance, Ukraine has followed a markedly different trajectory, which has emerged from a post-2014 development path and reflects a combination of centralized and decentralized models.

At the same time, the limits and trade-offs of Ukraine's approach are becoming clear. This paper examines how Ukraine's Ministry of Defence (MOD) is steering a hybrid defense ecosystem, integrating fast-moving, nontraditional vendors and new technologies with the institutional need for scale and standardization. A central question is whether Ukraine's rapid, bottom-up advances in procurement and innovation can be sustained without developing the ability to standardize and scale. The paper traces the evolution of procurement practices and the adoption of digital tools to streamline and, where needed, recentralize decisions. From this experience, it draws lessons for how defense governance can adapt under the pressures of prolonged, high-intensity war, and what other militaries might learn from Ukraine's approach.

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The analysis presented in this paper is based on qualitative research methods, primarily interviews conducted with representatives of the Ukrainian Armed Forces, the MOD, and the Defense Procurement Agency. These interviews provided first-hand insights into the evolving practices of defense acquisition and procurement under wartime conditions. All empirical evidence, including data and examples cited throughout the study, derives from these engagements. The reliance on practitioner testimony is intended to ensure that the findings are grounded in the experience of those directly responsible for shaping Ukraine's defense governance amid the pressures of high-intensity conflict.

Ukraine's Procurement Architecture for Innovative Capabilities

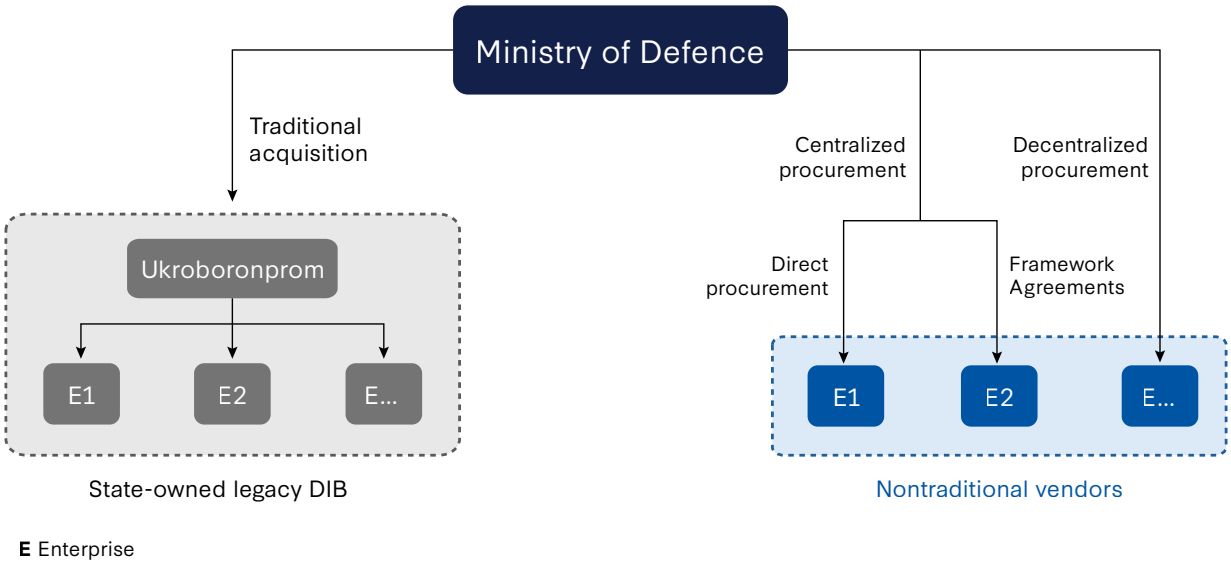
Ukraine's defense landscape today reflects a hybrid structure, combining the centralized, Soviet-inherited military industrial base and its accompanying acquisition processes with a uniquely dynamic, wartime-forged innovation ecosystem. This latter, more agile system, rooted in small teams, startups, and rapid battlefield feedback loops, is complemented by a fast-moving, highly responsive supply network, driven by hundreds of volunteer groups delivering critical equipment and support directly to the front lines. Together, these factors shaped Ukraine's improvisational defense architecture, which helped it endure the early stages of the war in parallel with the formal MOD-led procurement and innovation integration.

Over the three years of full-scale war, Ukraine's formal acquisition system has itself undergone significant evolution. Originally designed as a centrally managed legacy framework geared almost exclusively toward working with the Soviet-era state-owned military industrial base, it has been forced to adapt to new realities.

> *Ukraine's defense landscape today reflects a hybrid structure, combining the centralized, Soviet-inherited military industrial base and its accompanying acquisition processes with a uniquely dynamic, wartime-forged innovation ecosystem.*

As illustrated in Figure 2, alongside traditional acquisition that engages with the conventional defense industrial base (DIB), a parallel procurement system has emerged in direct response to the urgent need to integrate innovations from nontraditional vendors into military operations. While this framework primarily focuses on procuring off-the-shelf products, its role extends beyond simple acquisition. It enables a continuous, iterative cycle of collaboration between the Armed Forces and manufacturers, ensuring that battlefield feedback drives the rapid refinement and redeployment of capabilities.

Figure 1: Classification of Acquisition Pathways Within the Ukrainian Defense Ecosystem



Source: CSIS analysis.

This new parallel procurement system encompasses multiple pathways, which can be divided into centralized and decentralized models. Each pathway has evolved to remove bottlenecks in the procurement process, enabling faster delivery of cutting-edge technology to the Armed Forces through formal channels rather than relying on volunteers. Although these pathways operate simultaneously, creating a degree of complexity, they mark an evolution in the Ukrainian military's approach—not only to procurement but also to integrating end-user feedback for manufacturers and ensuring that the process remains as fast and transparent as possible for all stakeholders.

CENTRALIZED PROCUREMENT PATHWAYS

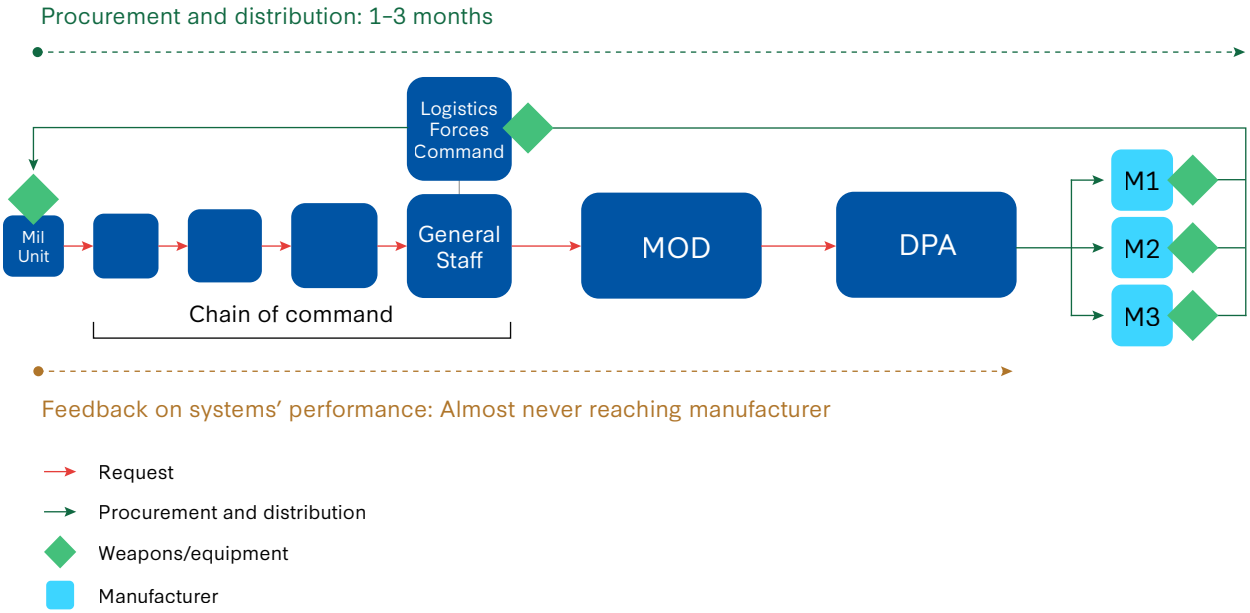
The centralized model remains the backbone of Ukraine's formal military procurement. Within this model, two distinct pathways have emerged—each with its own logic, procedures, and operational tempo.

1. **Direct Procurement**

   In its most traditional form, the centralized pathway operates through a tightly sequenced chain of command and approval. A military unit initiates the process by evaluating its annual needs, which are transmitted upward through the relevant service branch to the General Staff. There, these inputs are consolidated into a unified procurement request. This aggregated requirement is then submitted to the MOD's Department of Procurement, which reconciles the request with the available budget—often leading to adjustments in items or quantities.

   Once finalized, the requirement moves to the Defense Procurement Agency (DPA), which conducts tenders, negotiates contracts, and procures the equipment from manufacturers. Deliveries flow first to the Logistics Forces Command warehouses and then directly to operational units.

Figure 2: Flow of Direct Procurement



Source: CSIS analysis.

While the process ensures accountability and alignment with strategic priorities, it is inherently slow-moving, and its reliance on annual planning limits responsiveness to rapidly evolving battlefield needs. Notably, the system remains rooted in document-heavy procedures, with Excel-based forms still being the standard for submitting requirements. Feedback on systems' performance also almost never gets back to the manufacturer.

2. **Framework Agreements Based on Tactical-Technical Characteristics**

A more agile pathway within the centralized model replaces rigid specifications with the tactical-technical characteristics (TTC) of an unmanned system as the basis for procurement. Here, the Armed Forces provide the DPA not with a specific drone make, but with performance requirements such as range, payload capacity, or endurance. The DPA then conducts competitive procurement through the Prozorro platform, a government electronic procurement system, under the framework agreement procedure.

Framework agreements are signed with prequalified companies, creating a pool of suppliers who meet baseline criteria. Within this pool, targeted tenders are launched for specific batches of equipment that meet the defined TTC. For sensitive categories—such as first-person view (FPV) drones, the current focus of this mechanism—bidding takes place in Prozorro's closed module, hiding manufacturer details from public disclosure. Suppliers can submit proposals either directly or via authorized representatives.

While still centralized, this approach brings more agility to Ukrainian defense procurement. By contracting based on performance rather than specific models and manufacturers, it opens the market to a broader set of companies, sustains competition, and accelerates access to the latest commercially available technologies. While currently applied only to FPV drones,

the mechanism signals a potential shift toward more agile and market-inclusive procurement practices within the formal centralized system.

Overall, the centralized procurement model offers clear strengths but also notable limitations in a fast-moving wartime environment. Its primary advantage lies in enabling the MOD to build and maintain stockpiles, ensuring that military operations can be planned with a reliable understanding of available resources. Large, consolidated orders allow the state to secure favorable prices from manufacturers through competitive tenders.

However, this approach is often slow and rigid. Units may not receive the exact items they requested if priorities shift to other fronts or formations. Because manufacturers learn of demand only once tenders are announced, they cannot scale production in advance, leading to delays. The lengthy decisionmaking chain and procedural complexity can stretch delivery timelines to months, during which the product's specifications may become outdated compared to battlefield needs. In critical cases, this lag risks leaving units with severe shortages of essential equipment.

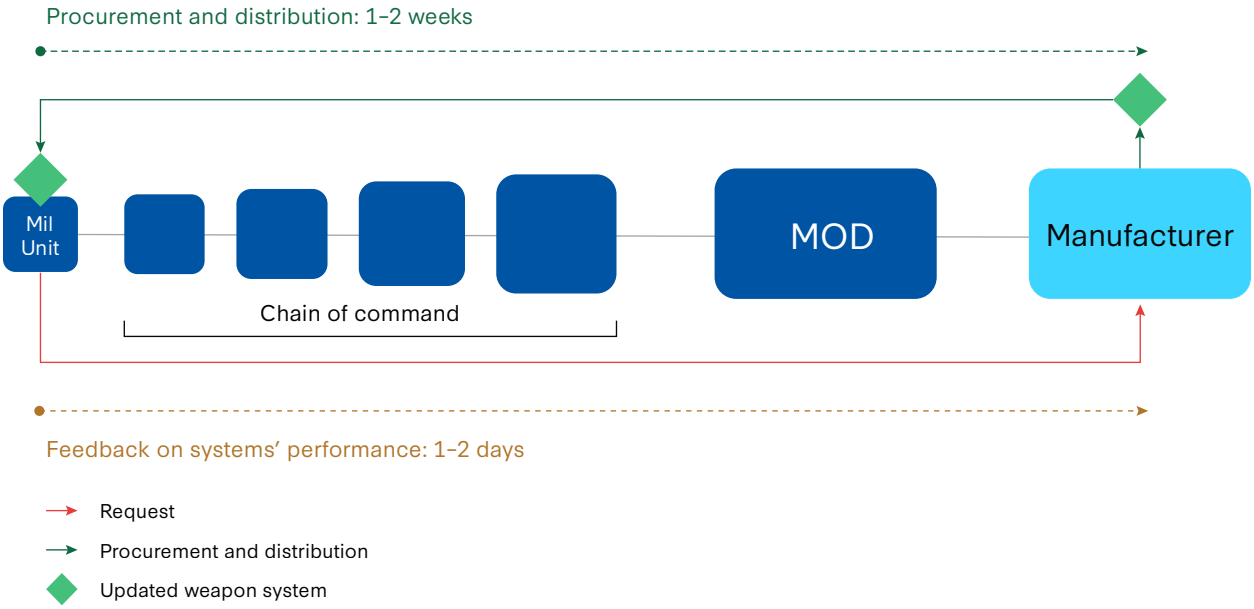
Most importantly, not all frontline units have direct contact with the manufacturer. The absence of a direct feedback channel means that some frontline input never reaches companies' engineers, or arrives in a distorted form, stripped of its original context and urgency. This disconnect undermines the ability to refine systems quickly and is arguably the most critical flaw of the centralized approach.

DECENTRALIZED PROCUREMENT PATHWAY

The second system is a decentralized, bottom-up model that emerged out of battlefield necessity. In response to the growing demand for diverse systems—many of which are produced by small, nontraditional Ukrainian startups—the government **delegated procurement authority** to the lowest levels of command. The Cabinet of Ministers granted nearly 700 military units direct access to procurement budgets. Military units started receiving funds straight from the State Budget, allowing them to make purchases without receiving central approval. In many cases, this funding was further supplemented by local governments, which were authorized to redirect portions of their budgets to directly support specific units on the frontline.

In this system, units bypass the formal procurement chain and procure directly from manufacturers, using their own funds. Feedback from units to manufacturers is similarly direct. This approach enables faster response times and greater flexibility but lacks coordination, standardization, and oversight.

Figure 3: Decentralized Bottom-up Procurement and Feedback Loop



Source: CSIS analysis.

In both systems, communication with drone and defense technology manufacturers has largely relied on informal, personal contacts. Relationships are typically built through word-of-mouth and individual connections rather than institutional channels, limiting the ability to scale effectively.

This decentralization of procurement has partially addressed the challenges of supply speed, demand satisfaction, and iterative development of innovative defense technologies. While such architecture offers tactical advantages, it has also introduced limitations that now hinder Ukraine's ability to scale its defense industry and remain competitive against Russia's accelerating war machine. In the existing structure, decentralized procurement lacks standardization, coordinated quality control, and long-term planning—all of which are necessary for sustainable mass production and defense industrial resilience.

> *Decentralization left the MOD with limited visibility into the broader ecosystem of technologies deployed across the Armed Forces.*

As the war has dragged on, these gaps have become increasingly apparent, presenting several critical challenges. First, the proliferation of startups and the diverse range of systems they produce created a fragmented technological landscape across the Armed Forces. On the government-supported **marketplace** alone, in its public version, there are more than 550 types of unmanned systems available for purchase. Many of these systems are not integrated into a unified data exchange environment—such as the MOD's Delta platform—thereby obstructing the creation of a common operational picture and limiting effective command and control at the tactical and strategic levels.

Second, the reliance on volunteer-led supply chains, which filled gaps left by a slow-moving government procurement system, proved agile but was ultimately unsustainable. While these ad hoc efforts can

respond quickly, they lack predictable funding streams and are unable to support procurement at scale. This unpredictability makes it difficult for manufacturers to understand demand patterns, secure long-term investment, and plan for consistent production or supply chain expansion.

Third, decentralization left the MOD with limited visibility into the broader ecosystem of technologies deployed across the Armed Forces. Since the MOD is not the only procurer of most systems, it struggles to systematically gather data on performance, user feedback, and operational needs. This hampered its ability to plan procurement pipelines, allocate resources effectively, and, crucially, issue large-scale contracts that would allow manufacturers to move beyond small-batch, startup-level production.

Fourth, frontline units often lack a comprehensive view of the technological landscape. Despite their procurement autonomy, it is practically impossible for them to maintain direct contact with hundreds of manufacturers while fighting in the war. Consequently, many units relied on familiar suppliers and systems, unaware of potentially superior alternatives available elsewhere on the market.

These limitations created a need for Ukraine to transition toward a more structured, government-led model that could preserve the agility of grassroots innovation while enabling scaling production, coordination, and strategic oversight. The answer would be digitization.

Inside Ukraine's Plan to Maintain Speed and Flexibility While Enhancing Coordination

To address issues of both centralized and decentralized procurement without slowing innovation, the MOD decided to digitize the process. It created digital platforms that connect every step—from identifying needs to procuring equipment and sending feedback directly to the manufacturer for improvements. This system is designed to make procurement faster while still keeping full oversight. It also allows orders for procurement to be combined so that manufacturers can receive larger contracts and scale their production, respectively.

The new Ukrainian model consists of a set of critical steps and digital tools which, when brought together, is designed to enable effective and continuous interaction between the defense industry and the military.

STEP 1. DIGITIZING BUREAUCRACY TO REMOVE PAPER FROM THE BATTLEFIELD

One of the most transformative developments within the MOD's reform agenda has been the digitization of administrative processes, beginning with what had long been the most burdensome and demoralizing feature of military life: paperwork.

Traditionally, the MOD was responsible for processing most personnel-related requests in the Armed Forces of Ukraine, ranging from medical leave to transition to a different military unit. As MOD representatives shared in interviews with CSIS, military personnel had to print and physically transport and sign request-related documents, a process that could last weeks or even months. At their peak, the Armed Forces were generating nearly 20 million paper requests annually, consuming vast amounts of time, energy, and institutional bandwidth.

This paper-bound bureaucracy had tangible operational consequences. For military personnel, it meant spending on average 100 minutes to create one request, then waiting for weeks without knowing the

request's status. For commanders, it meant spending up to 70 percent of their time on clerical tasks rather than on leadership, planning, or supporting their personnel and military effort.

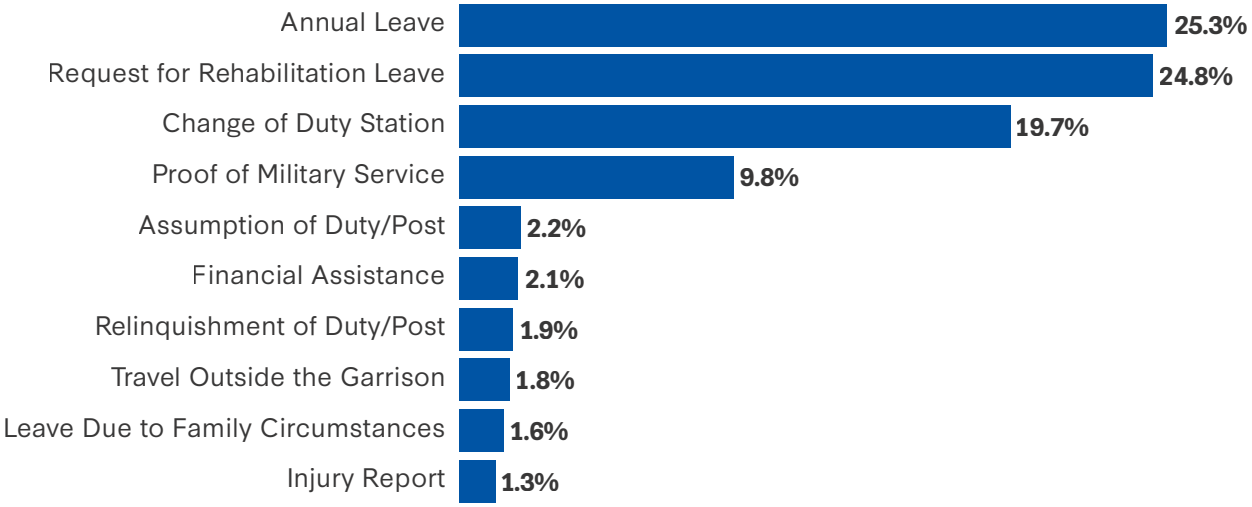
In addition, the estimated cost of processing one request is approximately UAH 100 (roughly equivalent to USD 2.40). This includes expenses for fuel (logistics to and from the personnel office), office supplies, printer usage, and other related materials. For 20 million annual reports, this cost adds up to around equivalent of USD 48 million—an amount that could just as easily purchase almost 100,000 FPV drones for the front lines.

In wartime, this inefficiency becomes not merely frustrating, but dangerous. Paper requests could be lost or damaged in the field, and the transfer of these documents—sometimes over 100 kilometers from frontline positions to command centers—imposes a physical threat. Entire administrative processes, such as inter-unit transfers, can be effectively paralyzed.

To resolve this problem, the MOD introduced **Army+**, a secure military mobile app designed by the MOD to serve as the interface between each individual soldier and the state. With more than **800,000 authorized military users**, Army+ replaces layers of paperwork with secure, encrypted communication, allowing soldiers to submit reports, access services, and participate in system-wide reforms in real time.

The digital system makes it possible for service members to generate, submit, and monitor their requests quickly, even in a matter of minutes. The app allows users to select from 42 standardized request types, with the most popular among them requests for annual and rehabilitation leave, reassignment, and proof of service, as shown in Figure 5.

Figure 4: The Most Popular Digital Requests



Source: Data provided to CSIS by the Ministry of Defence of Ukraine.

Service members submit these requests through digital templates guided by intuitive prompts. Each request contains an electronic signature and goes to the appropriate commander through a secure ID-based system. Commanders, in turn, can review and approve or reject submissions directly through the

platform; this includes the ability to batch-process up to 40 requests at once. Soldiers receive real-time updates on their request status, along with specific explanations if a request is denied, allowing them to resubmit without delay.

The impact of Army+ on processing requests has been immediate and far-reaching. The digitization of requests has improved internal communication and response times and fundamentally altered the relationship between soldiers and command structures. By minimizing bureaucratic friction, Army+ has returned valuable time and agency to warfighters.

Importantly, the Ukrainian MOD built Army+ with a strong emphasis on data protection and operational security. It stores no personal data on cloud servers, instead relying on secure, verified sources and local device encryption. Clearly, such a system is an obvious target for hostile cyber operations, which makes continuous investment in its protection essential. The platform's security framework therefore prioritizes ongoing monitoring, regular vulnerability testing, rapid patching of potential exploits, and layered defenses against intrusion. By acknowledging these risks and placing security at the center of its design, Army+ reflects the MOD's recognition that data resilience is as critical to operational effectiveness as functionality itself.

STEP 2. INTEGRATING SOLDIER FEEDBACK THROUGH SURVEYS AS A MECHANISM OF PARTICIPATORY REFORM

One of the most important features of Army+ is its built-in survey function. This instrument captures direct feedback from those who understand the needs of the military best: the warfighters themselves.

The MOD shared with CSIS that, as of July 28, 2025, it has conducted 18 surveys through the Army+ platform, gathering over 370,000 responses from service members across the Armed Forces. The scale and consistency of participation have validated surveys as a reliable instrument for informing institutional decisions and driving operational improvements.

These surveys have had tangible impacts across multiple domains of military service. For instance, when asked which skills they most wanted to develop, service members overwhelmingly requested training in operating drones. In response, the MOD launched the online course "Basics of UAV Operation"—available in Army+—and began developing a new leadership training course based on additional feedback. When consulted about digital command and control tools, personnel highlighted gaps in the functionality of secure communication within the Delta system, a situational awareness system used by the Ukrainian military. The MOD's Innovation Center responded by improving Delta's secure chat capabilities.

> *One of the most important features of Army+ is its built-in survey function. This instrument captures direct feedback from those who understand the needs of the military best: the warfighters themselves.*

Army+ surveys allow the Ministry of Defence to ground policy and product development in the lived realities of those serving. In doing so, Army+ is both digitizing soldiers' experiences and creating a feedback loop where each user helps shape the future of Ukraine's Armed Forces.

STEP 3. CLOSING THE DIGITAL FEEDBACK LOOP FOR DEFENSE MANUFACTURERS

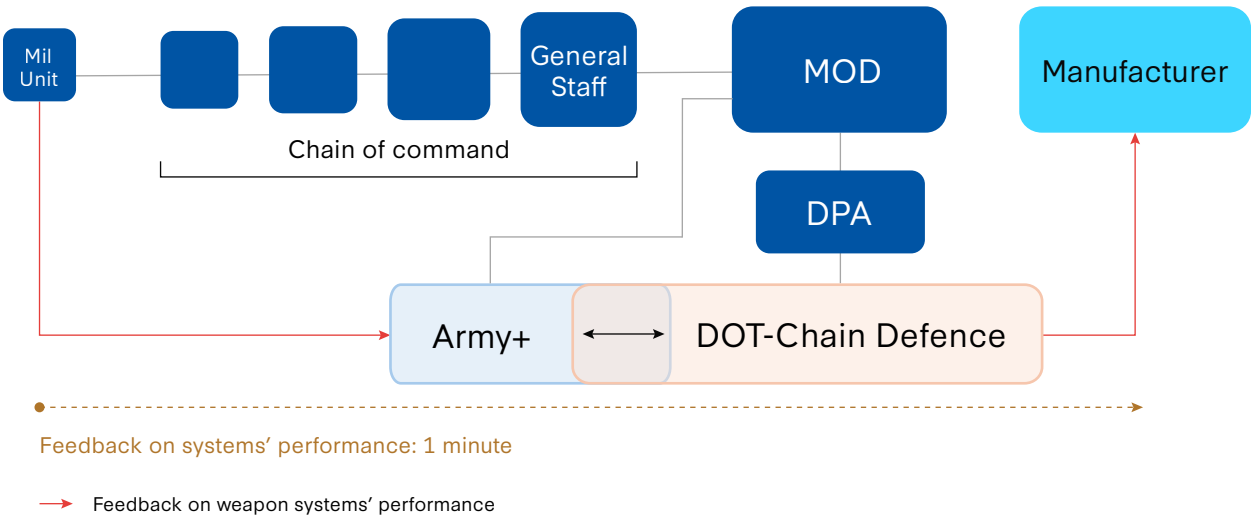
Encouraged by the success of internal surveys in shaping both digital services and institutional reforms, the MOD is taking the next step toward fully integrating the warfighter into the innovation cycle. The MOD is planning to introduce a new feature within Army+ called "Feedback," designed to establish a direct channel of communication between the soldiers on the front lines and the manufacturers developing and supplying their equipment.

This marks a profound shift in how Ukraine's defense ecosystem functions. The strength of Ukraine's domestic defense technology sector lies in its proximity to the battlefield and the real-time experience of its end users. Until now, communication between soldiers and manufacturers has been informal and fragmented, often relying on intermediaries such as commanders, volunteers, and ad hoc networks. Under the current system, a soldier who does not have a direct way to contact the manufacturer and encounters an issue—for instance, outdated unmanned aerial vehicle (UAV) frequencies—would notify a commander, who might compile similar feedback and pass it through the chain of command.

The feedback feature in Army+ is intended to break this bottleneck. According to the MOD's vision, it will allow every soldier to submit real-time feedback in Army+, which will be integrated with the **DOT-Chain Defence** system, a fully digitized military procurement and logistics platform. The feedback will be directly delivered to the manufacturer through these two connected platforms.

The mechanism is intended to be simple yet powerful. Soldiers will be able to input the serial number of the item, select the issue from a standardized drop-down list (initially including eight predefined UAV-related categories), and briefly describe the context in which the problem occurred. The interface will be intuitive, with in-app prompts guiding the user through the process in just a few clicks. Once submitted, the feedback will be transmitted directly to the manufacturer's digital dashboard within the DOT-Chain Defence ecosystem. If needed, the manufacturer can respond with detailed instructions or initiate direct contact via a secure, closed-loop messenger.

Figure 5: Streamlined Feedback Loop Through Army+ and DOT-Chain Defence



Source: CSIS analysis.

Although this feature has not yet been implemented and its precise technical design may evolve under the new minister of defence, who assumed office after the interview and before the publication of this report, the feedback mechanism is envisioned to deliver a dual benefit. For the soldier, it will offer the opportunity to influence the quality of tools critical to survival and success, as well as to receive faster, more relevant support. For manufacturers, it provides a real-time, structured, high-fidelity stream of frontline data, enabling them to identify flaws, validate new features, and iterate technologies based on operational realities rather than assumptions.

> *The feedback system represents a strategic breakthrough. . . . It accelerates not just technical fixes, but the entire process of capability development.*

More broadly, the feedback system represents a strategic breakthrough. By institutionalizing this loop within Army+, the MoD is positioning Ukraine's military-tech ecosystem to outpace its adversary in responsiveness and innovation. It accelerates not just technical fixes, but the entire process of capability development.

STEP 4. DOT-CHAIN DEFENCE: INTEGRATING FEEDBACK WITH MILITARY PROCUREMENT

In July 2025, the DPA launched a pilot deployment of DOT-Chain Defence. It consists of an online marketplace, similar in appearance to familiar online storefronts such as Amazon, which frontline units can use to procure equipment based on their immediate operational needs. This feature bears all the benefits of decentralized procurement.

The DOT-Chain Defence system **builds upon** the State Rear Operator's digital procurement system for nonlethal supplies, called simply DOT-Chain. This system, as MOD representatives shared in interviews with CSIS, has reduced delivery times of nonlethal goods by a factor of four and decreased the amount

of paperwork for the military by more than 30,000 documents per week. Now, the same approach to procurement though digital channels is being applied to weapon systems and tactical equipment.

In its pilot phase, DOT-Chain Defence is deployed across **12 AFU brigades**, with **UAH 1 billion** of funding allocated for the procurement of FPV drones via the DPA.

The process begins with the DPA signing an open contract with a manufacturer. Such a contract specifies the maximum quantity of products the manufacturer can supply but does not immediately commit to purchasing the full amount. Then DPA registers the manufacturer in the DOT-Chain Defence system, making its products available for purchase by military units. This part of the process is implemented from a centralized model, as discussed before.

However, the digital infrastructure of DOT-Chain Defence enables military units to browse an **online catalog** of pre-verified and contracted defense products and to choose the products they need. They can then submit an order or reserve upcoming batches.

Units place their orders directly through the DOT-Chain Defence platform, specifying the required quantities. Based on these orders, the DPA concludes an additional agreement with the manufacturer for the exact items requested. The manufacturer delivers the drones directly to the military, and payment is processed by the DPA only after delivery and the formal signing of the acceptance act.

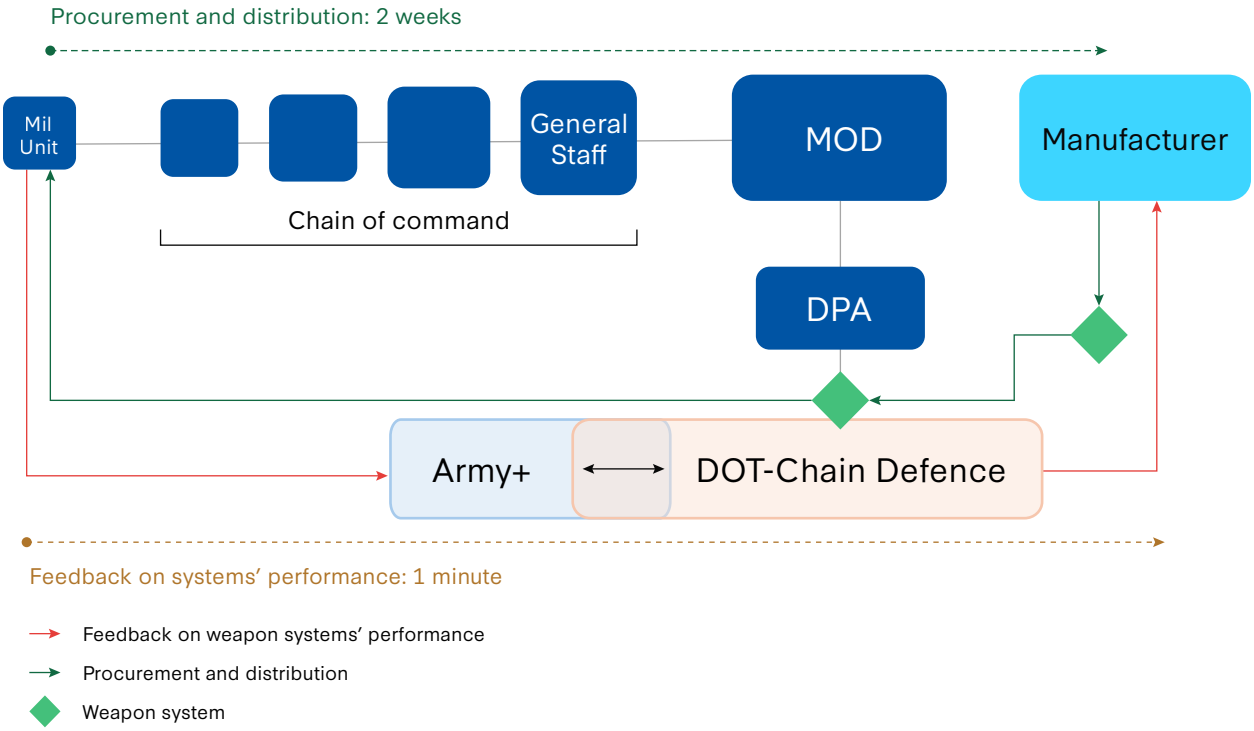
The approval of additional agreements is overseen by the MOD, which ensures that spending does not exceed authorized limits. This centralized structure combines the flexibility of on-demand ordering with centralized financial and logistical oversight, ensuring both speed and accountability.

The system digitizes every stage of the transaction, from selection and submission to signing, feedback, and logistics. Once the order is confirmed, the system alerts suppliers and the DPA simultaneously, ensuring fast, synchronized fulfillment. In urgent cases, deliveries can be completed within a few weeks—far outpacing the traditional procurement cycle, which often takes months.

> *DOT-Chain Defence is rapidly becoming the backbone of Ukraine's digitally enabled military procurement architecture. It blends speed, accuracy, and user-centered design to create a procurement environment where weapons and technologies are ordered, delivered, and improved based on real battlefield conditions.*

Critically, DOT-Chain Defence integrates an embedded feedback mechanism through its linkage with the Army+ application. This enables soldiers to report malfunctions or suggest improvements in real time. Feedback on drones and other technologies is routed directly to the manufacturer's digital dashboard within the DOT-Chain backend. As shown in Figure 6, this feature closes the loop between users and suppliers, enhancing battlefield responsiveness and accelerating iteration cycles for critical equipment.

Figure 6: Streamlined Feedback and Procurement Loop Through Digital Platforms



Source: CSIS analysis.

DOT-Chain Defence is a defense marketplace in the truest sense. It introduces a model of decentralized, needs-based procurement where combat units function as autonomous consumers within a secure ecosystem. All actors—military units, manufacturers, and state procurement officials—operate within a single transparent digital environment. This enables shared visibility and accountability over who orders what, in what quantities, and with what outcomes.

Furthermore, DOT-Chain becomes a central repository of "truth" about the actual needs of the Armed Forces. It generates an aggregated, real-time view of demand across units, equipping the MOD with better data to plan future acquisitions and budget allocations, as well as compiling disparate demand into bigger orders to allow manufacturers to scale their production.

The DOT-Chain Defence weapons marketplace has been validated through leading international cybersecurity standards. In 2025, it became the third state information and communication system in Ukraine to **pass assessment** for compliance with the U.S. National Institute of Standards and Technology (NIST) Risk Management Framework, a benchmark applied across federal agencies such as the Pentagon, NASA, and the CIA. This builds on **earlier achievements**, including ISO/IEC 27001 certification in 2024 and prior ISO 27011 recognition. These certifications demonstrate that DOT-Chain has been developed not only for functionality and stable operation but also with robust safeguards to protect sensitive defense data in line with international best practices.

DOT-Chain Defence is rapidly becoming the backbone of Ukraine's digitally enabled military procurement architecture. It blends speed, accuracy, and user-centered design to create a procurement

environment where weapons and technologies are ordered, delivered, and improved based on real battlefield conditions. This strengthens logistical resilience and amplifies Ukraine's technological edge in its ongoing struggle for sovereignty. As the system scales, it promises to permanently shift Ukraine's defense industrial complex toward agility, transparency, and tactical effectiveness, offering a compelling model for modern warfare logistics in the twenty-first century.

Conclusion

The war in Ukraine demonstrates that the future of warfare will require military governance systems to adapt rapidly, intelligently, and at scale. In this war of systems, Ukraine's most strategic asset has been its capacity to learn, evolve, and rewire its defense institutions under the pressures of full-scale, high-tech combat.

Ukraine's initial survival was enabled by decentralization and improvisation. But its long-term resilience now depends on integrating that agility into institutional structures capable of scale, coordination, and feedback. The MOD has begun to reengineer how the state interfaces with its armed forces, domestic industry, and society, building digital ecosystems that connect frontline needs with national capability development. These efforts are still evolving, but several key takeaways can be drawn from Ukrainian experience:

1. **Digitization must be treated as a core warfighting capability.**

   Due to their tendency to cause administrative bottlenecks, analog and paper-based processes are inefficient and strategically dangerous. Ukraine's shift from 20 million paper requests per year to real-time, app-based workflows has saved time, money, and lives. Systems like Army+ and DOT-Chain Defence illustrate how digital platforms can enable real-time responsiveness, secure communication, and battlefield-informed procurement. Militaries that fail to digitize their weapon platforms and bureaucracies will be slower and ultimately less capable of fighting.

2. **Frontline feedback should be institutionalized, not improvised.**

   One of Ukraine's most important innovations has been its effort to integrate the warfighter into the defense innovation cycle. Digital feedback loops are now embedded in Army+ and directly connected to suppliers via DOT-Chain. They enable rapid product iteration and battlefield-informed development. This moves beyond traditional pilot programs or post-mission reporting, redefining the soldier as a co-developer in the broader defense ecosystem. Peacetime militaries should build similar mechanisms that turn experience into capability in real time.

3. **The state should act as a platform, not a bottleneck.**

   Ukraine's decentralized innovation ecosystem has flourished partially because the state enabled it. The emerging model in which the government provides digital infrastructure, regulatory frameworks, and procurement pathways allows military units and manufacturers to operate efficiently within shared strategic guardrails. This platform-based approach offers a pathway for militaries to retain strategic oversight while empowering bottom-up solutions and scaling what works.

4. **What should not be done: letting decentralization substitute for institutional reform.**

   While grassroots innovation helped Ukraine survive the early phases of the war, it also introduced fragmentation, interoperability challenges, and supply unpredictability. Allowing decentralized systems to persist without integration or oversight risks undermining coordination, scaling, and strategic planning. Militaries must resist the temptation to view workarounds as permanent solutions. Improvisation must evolve into structured systems, or else the very agility that fuels adaptation can become a barrier to sustained capability development.

   As Ukraine continues to modernize in wartime, it is building one of the most advanced defense governance models of the digital age: one where soldiers can shape the tools they fight with, procurement is driven by real-time needs, and innovation emerges from labs, trenches, and command centers alike. For militaries preparing for future conflict, the Ukrainian experience is not just a case study—it is a call to rethink how institutions learn, adapt, and fight. ■

Kateryna Bondar *is a fellow with the Wadhwani AI Center at the Center for Strategic and International Studies in Washington, D.C.*

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