Picture credit: US Dept Defense

SUPPLY AND DEMAND

Tim Scammell *and* **Mark Holder** *explain why the supply chains that underpin Britain's national security must be brought up to speed*

The development of modern-day consumer goods supply chains is one of history's most incredible feats of human ingenuity: mind-bogglingly complex networks pull resources from across the world at incredible efficiency to provide consumers with everything from soap to SUVs. In part, this has been made possible by a century of globalisation, market pressures and colossal container ships. But more than any other fact, it's been enabled by technological advancements in the form of supply chain management software and increasingly AI and machine learning, that have refined these processes and created the efficiency that can make a global supply chain cost effective.

The same advances are not as evident in the supply chains underpinning UK defence. Many of the processes that have existed over the last 75 years are still recognisable in the Ministry of Defence (MOD). Yet, at the same time, the conflicts the UK has been engaged in have changed fundamentally. This disparity between process capabilities and operational needs could easily impact our national readiness and thus the real level of national security.

Here, we explore why supply chains are important to national security, highlight some key challenges faced by UK defence decision-makers and identify solutions – often based on civilian technology – that could be easily employed today to incrementally improve our nation's security simply through more contemporary logistic practices.

The challenge is to efficiently deliver the right item to the right person at the right time

Supply chains in the defence sector are incredibly complex: whether the mass production of boots and uniforms or the procurement of handheld devices, weapons, GPS systems, AI and machine learning.

The sheer quantity and diversity of equipment needed are staggering. Consider the average modern British infantry soldier is outfitted with over £25,000 of personnel equipment, comprising hundreds of individual items. A platoon of 30 soldiers, therefore, walks into the field with over £750,000 of equipment, and when operating in hot conditions, will consume over 200 litres of water a day to remain effective. One key part of this equipment is the 10kg of ammunition that each soldier carries – sufficient for just a single engagement with the enemy.

Should that platoon need support, 105mm artillery shells (each weighing 20kg) can be fired by a single gun at a rate of up to seven rounds every 60 seconds – meaning a 'fire mission' supporting infantry can consume almost one tonne of munitions in under a minute. To bring this water and ammunition to the soldiers in the field, an RAF C130 cargo plane burns around two tonnes of fuel every hour and requires hundreds of people to maintain and operate.

GETTING IT RIGHT

All these personnel must also be trained in the use of this equipment – mostly in the UK, but sometimes overseas – before the platoon and its support are deployed in the field thousands of miles away from major MOD logistics centres. As such, the modern challenge is to efficiently deliver the right item to the right person at the right time while avoiding wastage and minimising cost to the taxpayer. This is a mammoth task, as each piece of kit – from an artillery shell to a water bottle – is essential and must be ready when and where needed. Within such a context, it's not hard to see how seemingly mundane supply issues can have massive consequences.

The Second Gulf War required a huge number of resources to be moved from bases in the UK and Germany to Iraq in a matter of weeks. Parts for complex items like aircraft had to be supplied at the same time as troops were provisioned with the right amount of water, food, personal kit and ammunition.

These large volumes and short timescales highlighted some of the weaknesses of existing information systems, as they often struggled to track items in the supply chain with the inevitable results of stockpiling, over ordering or underequipped personnel. From this example, it's clear the ability of the UK's armed forces to protect UK national interests is determined as much by its logistic competence as by the prowess of Britain's service personnel.

Thus, we return to the ability of technology to have an impact in this complex and demanding domain. We can draw useful lessons and examples directly from the commercial sector to highlight what's possible. Within the MOD, ammunition presents a major logistical challenge: too much moisture can wreak havoc with its effectiveness and violent handling can damage fuses. Not only must ammunition be carried with the utmost care, but almost paradoxically it should be delivered in a format that's usable immediately.

We can use existing technology to address these challenges. Packaging can be tagged with QR codes describing key information, such as calibre and type. We can then link these codes with IoT devices built into packaging that measures environmental conditions such as moisture levels and detect any shocks associated with improper handling. Tracking this information digitally enables logistics professionals to resolve issues quickly and reduce the risk inherent in ammunition handling. Given sensors and tracking tech are already ubiquitous in the civilian world, they are cost-effective investments and can be easily retrofitted into MOD processes.

IT'S NOT HARD TO SEE HOW MUNDANE SUPPLY ISSUES CAN HAVE SUCH MASSIVE CONSEQUENCES

Water poses other challenges: it is heavy, difficult to move and personnel consume a lot of it. So, the key to delivery is understanding exactly how much is needed. Handheld devices such as digital assistants and data recorders have many civilian applications – from supermarket staff using tablets to manage stock levels to delivery drivers tracking packages. Similar digital recorders would allow data to be aggregated quickly in the field and then communicated with ease. A platoon sergeant using similar equipment would be able to track the consumption of water, ammunition and other resources within the platoon and digitalising this would enable faster resupply and demand less time from this busy non-commissioned officer.

Taking this kind of technology one step further leads us to IoT health trackers. This technology has been trialled successfully by bus companies in Japan, where the health of drivers is monitored to protect the safety of the passengers. The same type of technology has been applied to the mouth guards of rugby players to monitor potential head injuries and concussions. Applied in a military environment, this technology could save lives – the sensor could trigger an alert when hydration levels, pulse rates or blood pressure moves out of the normal range. It could also be used to assist with locating soldiers who may have lost consciousness due to injuries, thereby allowing a faster emergency response. This technology also applies to heavier war machinery, like artillery, which can benefit from the application of civilian technologies. These precision devices need to be maintained regularly to retain their accuracy and effectiveness.

Increasingly large domestic appliances include integrated sensors that track usage and report behaviours to both the consumer and the manufacturer. Adapting this technology would provide near-real-time updates on maintenance requirements such as barrel wear and serviceability. It could also provide real-time supply markers, such as how many rounds, the type of projectile and providing rear-echelon teams with information they need to quickly replace the expended ordinance.

As all this information flows back to the logistic hubs in the MOD, the amount of data can become daunting. Civilian enterprises leverage artificial technology (AI) and machine learning to remove the bulk of the processing from human logistics professionals. Frameworks in many systems allow the agile creation of this technology and the ability to tailor it to new circumstances. Once machine learning or AI has dealt with most cases, the remaining complex requirements can be dealt with by professionals, where their skills are critical. However, even decades of experience can be augmented with predictive analytics, embedded planning and interactive real-time reporting that draws the attention of the MOD professional to the most critical and time-sensitive issues.

There are also fascinating, and potentially game-changing, technologies in development that could push the envelope even further. These adaptations of civilian innovations could provide the UK with a major strategic advantage.

Consider Amazon's proposed delivery drone service: automated military drones in a similar mould could deliver ammunition, water and other supplies to forward-deployed troops in dangerous and isolated environments. This would negate the need for supporting personnel to ferry kits back and forth. Existing technology imposes limitations on the amount drones can carry, but further investment and innovation in the area could prove fruitful and significantly reduce the threat posed by IEDs.

Self-driving vehicles could also be developed to act as protected transport. An 'MOD Tesla' could deliver equipment to the front lines or act as ambulances for the recovery of the sick or wounded. In this role, self-driving vehicles would eliminate the need for personnel to risk harm when in transit and open the possibility for recovery of injured personnel from the most extreme environments.

In a co-authored 2010 review of supply chain processes used during the war in Afghanistan, Air Vice-Marshal Matt Wiles CBE RAF stated that a: "good supply chain is the basis for success" and outlined several guiding lessons from the conflict on scientific and data-led planning. In the decade since, the technology used in private sector supply chains has come on leaps and bounds – and yet for today's military personnel, their reality is not significantly different from those discussed in Wiles' assessment.

The ideas outlined here are not frivolous, as the challenges faced by the MOD are real and urgent.

THE AVERAGE BRITISH INFANTRY SOLDIER IS OUTFITTED WITH OVER £25,000 OF EQUIPMENT

Budgets are tight, each investment must be carefully considered and the consequences of ineffective solutions are severe.

Herein lies the benefit of drawing on private sector expertise: the world's biggest companies are already investing vast R&D budgets into civilian applications funded by consumers. The ideas discussed above are simply applying existing technology to the challenges of the MOD and benefiting from proven R&D ●

Tim Scammell is Industry Account Executive – Defence and Police Customers at SAP. **Mark Holder** is Industry Advisor – Public Sector, Defence & Security, SAP EMEA North.

Existing technology imposes limitations on the amount drones can carry, but further investment and innovation in the area could prove fruitful

Picture credit: US Dept Defense