

JULIA MURAVSKA, ANNA KNACK, REBECCA LUCAS, BEN WILLIAMS

# Challenges and barriers that limit the productivity and competitiveness of UK defence supply chains

**R**AND Europe conducted a study for the UK Ministry of Defence (MOD) to build the evidence base for a pilot programme to enhance UK defence supply chains. The goal of such a pilot programme is to invest resources to identify suitable opportunities and remove barriers to enhancing supply chain productivity and competitiveness. In turn, the aspiration is to increase the benefits that defence and the wider UK economy can obtain from its supply chains development and, specifically, from the advanced manufacturing innovation ecosystem. In order to do this, any potential defence supply chain development initiative should be targeted at those areas that are judged to be restrictive to productivity and competitiveness. To identify what these areas are, the RAND Europe team has explored the main challenges and barriers faced by companies across the tiers of UK defence supply chains, which can diminish the productivity and competitiveness of supply chains as a whole.

The findings are presented below and form the background of a larger study that has been delivered to MOD. The aim of this year-long study was to develop a

set of potential intervention options to support and develop defence supply chains in the UK, which could then be trialled via self-contained pilot programmes. Drawing on the background understanding of the challenges and barriers, the RAND research team developed detailed proposals for supply chain pilots to help enhance productivity and competitiveness of UK defence supply chains. The challenges and needs presented here have been mainly derived from discussions with 42 stakeholders. These include stakeholders from government, industry associations, industry primes and lower-tier suppliers.<sup>1</sup> Specifically, 'lower tier' refers to mid-tier, mid-size and small and medium-sized enterprises (SMEs) – that is, non-prime defence contractors. These have been supplemented by a review of academic and grey literature (e.g. reports from industry associations, defence company websites, UK government websites, innovation organisations and independent research organisations) in order to provide a considered, well-referenced analysis.

## **Challenges and barriers that limit the productivity and competitiveness of UK defence supply chains**

The productivity of the UK economy has been lagging behind many other G7 and Organisation for Economic Co-operation and Development (OECD) member states since at least the 1990s.<sup>2</sup> Like other sectors, some parts of UK defence supply chains suffer from productivity shortfalls that may constrain their performance and price competitiveness. While the productivity gap was highlighted by most of the stakeholders consulted for this study - including when comparing the UK to other major European defence powers France and Germany - they viewed this challenge as closely linked to price and export competitiveness of supply chains.<sup>3</sup> It is important to recognise that the impact of the productivity gap is felt in some domains more than others, and some UK defence companies also perform relatively well against productivity and competitiveness indicators.<sup>4</sup> At the same time, the study team's review of UK defence supply chain support initiatives revealed that the majority are aimed at improving productivity and supporting export competitiveness, highlighting widespread concerns regarding low productivity and uncertain competitiveness performance in the defence industry.

RAND Europe research has uncovered a number of challenges and features of the defence market that can weaken the productivity and competitiveness of existing defence suppliers, while also disincentivising potential new suppliers from entering or growing in the defence market.

The six supply chain challenges identified by RAND, which will be covered in detail below, include:

- Difficulties accessing and engaging with both top-tier companies and the MOD;
- Difficulties attracting and engaging with non-traditional suppliers;
- Barriers stemming from defence contracting terms and processes;
- Shortages in critical defence industrial skills;
- Slow adoption of innovative and advanced manufacturing processes and technologies;
- Difficulties enforcing and monitoring compliance with cybersecurity and other accreditations.

These challenges and barriers can, if unaddressed, undermine resilience and economic contribution of defence supply chains, and create risks for the UK as it faces stronger global competitors more willing to embrace innovative approaches.

As the research was conducted in the midst of the COVID-19 pandemic, it also considered the pandemic's implications for the defence sector, although this was not the focus of the study. RAND work highlighted that defence supply chains faced several immediate challenges to the timely delivery of defence programmes due to the damage inflicted by delays in production, and deferred payments to defence suppliers.<sup>5</sup> The study concluded, however, that Defence is likely to be less impacted than other sectors because of its criticality to national security, as well as the importance of timeliness of defence procurement budgets and contracts to the MOD.<sup>6</sup> One industry stakeholder echoed this view, stating that as long as demand from the MOD does not change, COVID-19 is unlikely to leave an indelible detrimental impact.<sup>7</sup> At the same time, relying on demand alone will not be sufficient to address long-running supply challenges, as this research

demonstrates, and it is important to address underlying areas of vulnerability within supply chains.

### **SME and mid-tier suppliers report difficulties accessing and engaging with both top-tier suppliers and the MOD**

The barrier that supply chains most frequently associated with limiting productivity was the difficulty SME and mid-tier suppliers encounter engaging with prime contractors and the MOD.<sup>8</sup> These include marketing their businesses and product offerings to primes, as well as limited

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'Primes have an efficiency advantage in engaging and responding to classified tenders because they have the necessary IT infrastructure. The primes and Tier 2s also have synchronised networks between internal secure servers [...]. As a SME, we're only prepared to pay the annual fee to have a single desktop to enable us, when we need to communicate independently with MOD and primes – this adds an additional burden.' (INT B17)

opportunities to interface directly with the MOD, since primes often manage lower-tier suppliers' interactions with government.<sup>9</sup> The size and complexity of Tier 1 defence companies,<sup>10</sup> as well as staff churn in MOD posts, often lead to a discontinuity in professional and contractual relationships, which further complicate lower-tier suppliers' ability to identify points of contact.<sup>11</sup> These reported tensions, alongside high barriers to entering the defence market, disincentivise lower-tier suppliers from actively participating in the market, reducing their overall competitiveness and resilience.

UK SMEs also report a lack of access to corporate support functions (e.g. strategy, marketing and sales teams) that are needed to achieve approved supplier status, bid for defence contracts with the MOD and appeal to prime contractors.<sup>12</sup> In contrast to Tier 1 suppliers who have dedicated and experienced departments for defence procurements, lower-tier suppliers can struggle to navigate procurement processes in the defence sector. In the long term, resource limitations could be prohibitive to suppliers with innovative manufacturing capabilities that could otherwise help strengthen the UK defence industrial base.

Our research findings also indicate that SMEs often need to scale up or improve their capabilities in order to undertake defence work. Mid-sized companies, in particular, could support a self-sustaining culture of innovation in the UK,<sup>13</sup> because they tend to have higher levels of ambition and potential for growth and R&D than small suppliers. In order to realise these benefits, however, they

could benefit from support accessing primes and the MOD, as well as having more sustainable access to finance.<sup>14</sup> Investing in growing mid-size companies could also increase the pool of suppliers that Tier 1 companies could choose to draw upon, which could boost supply chain resilience.<sup>15</sup>

A number of stakeholders consulted for this research referenced examples of good practice that the UK could benefit from across the Atlantic.<sup>16</sup> The US Department of Defense (DoD) has significantly more experience engaging lower-tier suppliers and helping them overcome challenges such as contracting complexity and funding shortfalls.<sup>17</sup> This is enabled by an explicit policy emphasis on this objective, as well as a clear responsibility and dedicated funding. The Office of Small Business Programs (OSBP) was created specifically to interface with small businesses, and there are a number of additional programmes and offices across the DoD that engage with small businesses.<sup>18</sup> This is partly a function of the Department's significantly greater size and financial resources than those of the MOD (which brings its own coherence and efficiency challenges).<sup>19</sup> However, the large number of potential points of contact and engagement opportunities also mean an increased number of entry vectors for small businesses, while increasing the DoD's probability of interfacing with potential suppliers who may bring added value to defence supply chains. Box 1 presents a summary of lessons learnt from the DoD approaches towards supply chain development, which may have utility for the UK context.

## Box 1. Lessons from US supply chain development initiatives

- The DoD Small Business Strategy identifies under-represented lower-tier suppliers in order to target incentives and financial support to suppliers that need the most support, such as woman- and veteran-owned small businesses (WOSB/VOSB)<sup>20</sup> or historically underutilised business zones (HUBZones).<sup>21</sup>
- A number of DoD initiatives simplify or help lower-tier suppliers understand complex defence procurement processes. In addition to the central OSBP, other agencies and procurement departments across DoD have their own small business offices, which serve as clear points of contact and resources of guidance and assistance throughout the contracting process, but often actively reach out to individual lower-tier suppliers.<sup>22</sup>
- The DoD offers higher levels of direct funding or matches lower-tier suppliers with funders from an approved roster. To help suppliers considered important for the defence supply chain, the DoD created its Trusted Capital programme to match innovative lower-tier suppliers with approved funders. These funders have been deemed 'safe' from a security perspective, making it easier for small businesses to screen potential acquisition offers.<sup>23</sup>
- The US aligns incentives such as awards to encourage Tier 1 suppliers to work with lower-tier suppliers. One example is the Mentor-Protégé Program (MPP), which is a long-running DoD initiative to encourage large companies to partner and sub-contract with small businesses when competing for DoD contracts.<sup>24</sup> MPP includes financial incentives to formalise these partnerships through well-established contracting mechanisms.<sup>25</sup> The programme includes an award scheme to recognise effective mentors, generating positive publicity and DoD exposure for large companies that effectively support lower-tier suppliers.<sup>26</sup>

### UK defence supply chains find it difficult to attract non-traditional suppliers

Despite increasing opportunities for cross-sectoral engagement (e.g. through defence programmes, the High Value Manufacturing Catapult and other supply chain development initiatives), UK defence supply chains still have problems attracting investors and collaborators from other sectors. This lack of appeal to non-traditional players can limit opportunities for innovation.<sup>27</sup> Stakeholders reported that the defence sector suffers from a negative perception given the slow, inflexible and heavily bureaucratic

processes associated with defence procurement contracts and the sub-contracts issued by Tier 1 companies.<sup>28</sup> Specifically, some stakeholders reported difficulties in coming to grips with the complexity of a defence market characterised by multiple points of market entry, long processes, small number of highly influential prime defence contractors, and restrictive financial and security regulations.<sup>29</sup> The defence sector is often perceived by non-traditional suppliers to be impenetrable, because of the widespread use of defence jargon, which disadvantages outsiders.<sup>30</sup>

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‘Communication (with MOD) is therefore really important. [...] We’re at the tail end of the supply chain. [...] I have to react with the resources that I have available at the time with no lead time. Further down the supply chain, the issue gets exaggerated at each step.’ (INT B18)

In order to access the defence market, non-traditional suppliers would need to:

- Allocate resources to adapt their products for future defence capabilities;
- Upgrade the security standards of their products;
- Invest in secure infrastructure capacities (e.g. synchronised networks between internal secure servers);
- Reshape their business to meet the needs of the defence sector.<sup>31</sup>

The costs of taking all these steps, however, may not justify the projected return on investment.<sup>32</sup> Critically, non-traditional suppliers may also struggle with accessing funding and support, or may simply not be aware of existing funding sources.<sup>33</sup>

In addition, non-traditional suppliers may be reluctant to engage with Defence because of concerns surrounding the loss of rights to their own intellectual property (IP) and

the potential loss of their ability to generate IP for exploitation in the long term.<sup>34</sup> In the broader sense, concerns regarding inadequate IP protection raised by SMEs indicate that the UK could struggle to protect national technological property in the future, and to attribute innovations and their economic contributions to the UK.<sup>35</sup> In contrast, some stakeholders highlighted the more favourable approach to IP regulations in the US,<sup>36</sup> which was reported to be more flexible towards allowing lower-tier suppliers to retain IP and apply their intellectual IP in areas beyond defence applications.<sup>37</sup>

### **Defence contracting terms and processes present barriers to supply chain development**

In addition to the IP constraints described above, there are other demand-side issues that contribute to the difficulties small and mid-size defence suppliers face when operating in the defence market. The culture and ways of working within the defence sector are not yet calibrated to most effectively recognise and absorb innovation from lower-tier suppliers.<sup>38</sup> A number of interviewees felt that the MOD’s approach to contracting is inflexible, disadvantages lower-tier suppliers, and discourages innovation. Principally,

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‘If you’re a small business in the US, you have a reduced set of terms. There is no flexibility on that in the UK.’ (INT C5)

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‘One of the issues with SMEs and productivity – they often have good products, but they can’t scale it up, and produce it at the rates that it’s needed.’ (INT A18)

defence contracts are set out in similar ways for Tier 1 and lower-tier suppliers, and those contract terms are not always appropriately scaled for SMEs.<sup>39</sup> For instance, defining detailed requirements for all systems and sub-systems of a major piece of equipment such as a fighter jet or warship in a single tender puts the prime contractor in charge of identifying and sourcing suppliers of those systems and sub-systems, making it difficult for them to showcase their technological and manufacturing capabilities to the MOD directly.<sup>40</sup>

In addition, according to defence suppliers consulted for this study, defence contracts are not defined in a way that allows them to understand the challenges the end users of defence equipment are facing. This, in turn, makes it more difficult to consider how SMEs and mid-caps can tailor their solutions to address those problems, and can ultimately lead to faults or delays in the defence equipment itself.<sup>41</sup> Moreover, SMEs felt that the compliance criteria in defence contracts did not differentiate sufficiently between Tier 1 and lower-tier suppliers, and were thus difficult for the smaller players to meet.<sup>42</sup> Primes, in turn, were reported to flow down the difficult terms to their SME subcontractors.<sup>43</sup> On the flip side, Tier 1 companies expressed

concern that lower-tier suppliers sometimes accept subcontracting obligations they may be unable to meet. This further contributes towards Tier 1 suppliers’ ambivalence towards engaging with unknown suppliers.<sup>44</sup> In order to integrate a new SME into a defence supply chain, their activities may first need to be scaled up and they may need support with technical skills, defence knowledge and meeting the financial requirements.

Defence contracts can also be too rigid to allow for mid-life upgrades and spiral development as technology develops.<sup>45</sup> Some stakeholders consulted for this study believed that defence contracts assume the same rate of innovation for all sub-systems and components within equipment like warships, fighter jets and armoured vehicles. In reality, some sub-systems (e.g. those underpinning digital solutions) evolve faster than others and could be leveraged by lower-tier suppliers to offer an improved technological solution.<sup>46</sup> To do so, however, would require the MOD and the Tier 1 supplier to agree to amend the initial sub-system specification mid-life, or while the contract is already being fulfilled, depriving the Tier 1 supplier of opportunity to supply its own sub-systems.<sup>47</sup>

Finally, our research indicates a lack of standardisation in MOD and primes’ science and technology (S&T) contracting processes. In practice, this means that suppliers have to demonstrate that they meet a host of non-technical criteria for each bid, despite having a track record with Defence.<sup>48</sup> Over time, this repetitive and costly process disincentivises lower-tier suppliers from engaging with the defence sector.

## UK defence supply chains are constrained by shortages in critical defence industrial skills

Similar to other sectors and non-UK defence supply chains, UK defence supply chains experience continuous challenges in harnessing the volume and quality of skills required to innovate, maintain current capabilities, and sustain the UK's global market position.<sup>49</sup> Although the MOD has recognised skills issues in policy documents such as the National Cyber Security Strategy (NCSS),<sup>50</sup> the absence of a clear and dedicated defence strategy for closing skills gaps and addressing recruitment and training may further limit industry players' capacity to overcome this challenge.<sup>51</sup>

Skills gaps and shortages across vocational skills and cross-cutting skillsets such as advanced, composite and additive manufacturing; nanotechnology; quantum science; systems and software engineering; security algorithms; mechanical engineering; and project management<sup>52</sup> remain among the most frequent reasons for delays and cost overruns in equipment programmes.<sup>53</sup> Although the UK education system is renowned for developing high-quality education, and offers skills development opportunities across the full range of skills required in defence, many industry players identify gaps in cross-cutting skillsets.<sup>54</sup> In a study on the UK aerospace supply chain commissioned by the Department for Business, Energy, and Industrial Strategy (BEIS), 43 per cent of respondents also expressed difficulties in accessing resources for upskilling their workforce.<sup>55</sup> It should be noted, however, that some areas are reported by stakeholders to have ample supply in some skill areas (e.g. naval

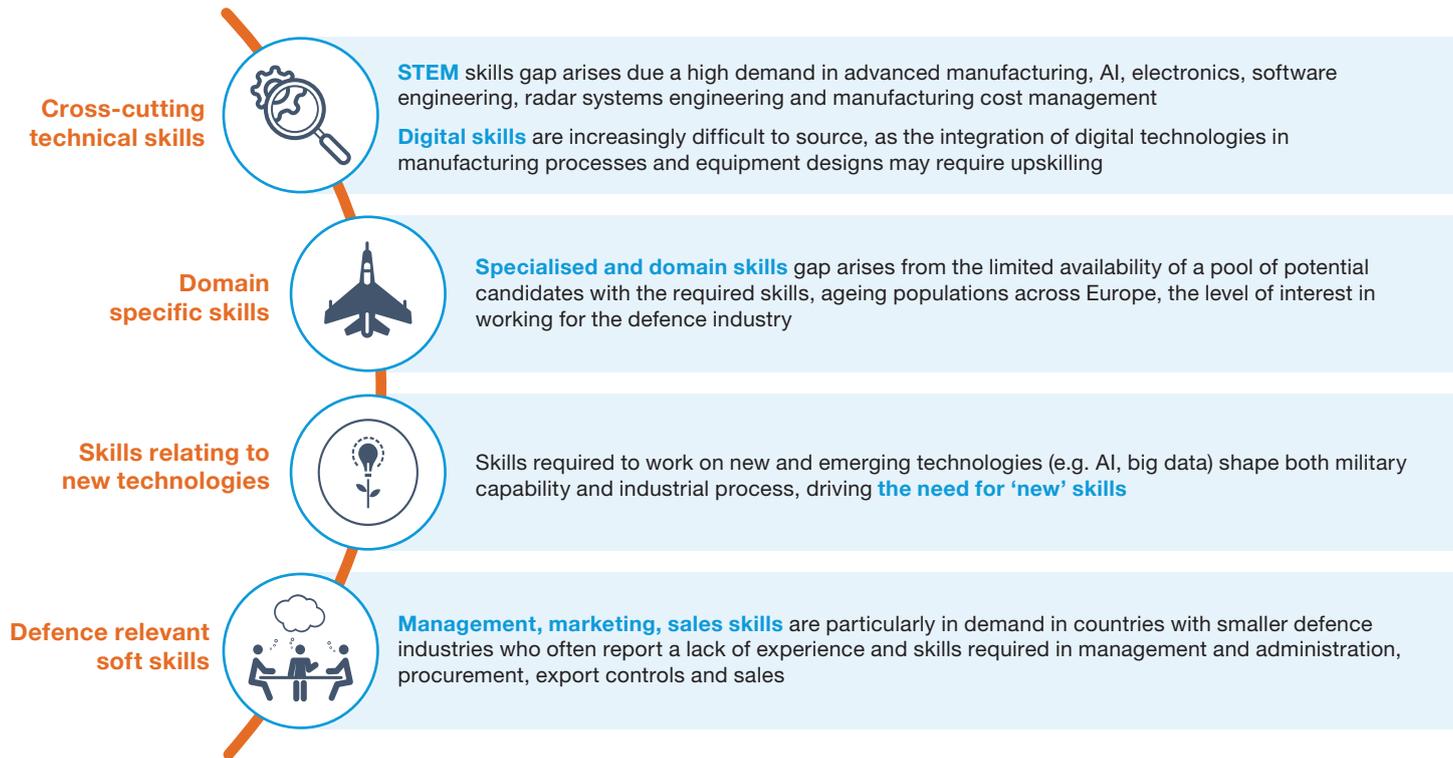
design),<sup>56</sup> and one interviewee from a sector-agnostic industry association reported a surplus in STEM skills.<sup>57</sup> However, overall, the overwhelming evidence points to shortages in critical defence industrial skills in the UK and across European defence industry (see Figure 1).

Defence supply chains' ability to harness critical industrial skills may be constrained by factors such as ethical reservations towards the defence sector and a reported lack of awareness over potential skills requirements from non-STEM skills sets (e.g. leadership, strategic defence human resources, finance).<sup>58</sup>

Relatively less attractive salaries and benefit packages (e.g. mobility), as well as high-security regulations (e.g. security and nationality requirements) compared with other sectors may also dissuade potential recruits from entering the defence industry.<sup>59</sup> The relatively low financial and non-financial benefits packages in defence engineering professions compared with other sectors can also depreciate the relative prestige of defence engineering from the view of potential STEM students and graduates. Together, these trends could be indirectly perpetuating skills gaps.<sup>60</sup>

Additionally, recent STEM graduates may be reluctant to join the defence supply chain because of the periodicity of defence procurements, which make careers in the defence sector less attractive to high-potential talent interested in stimulating state-of-the-art research.<sup>61</sup> At the same time, there is potential to mitigate this challenge, as the use of novel technologies such as AI, quantum computing and material science in high-profile capability programmes such as Tempest are able to offer novel technology exploitation and cutting-edge research opportunities to new talent seeking challenging and prestigious opportunities.<sup>62</sup>

Figure 1. Skills mismatches in the European defence industrial base



SOURCE: Muravska et al. (2019)

## Defence appears to be slower than other sectors at taking up innovative processes and advanced manufacturing technologies

According to this research, the defence sector as a whole has been slower than commercial industries in taking up new manufacturing processes and technologies commonly associated with Industry 4.0,<sup>63</sup> which loosely refers to

increased 'connectivity, communication and digitisation' in manufacturing.<sup>64</sup> One major reason for this lag is security concerns and regulations related to the digitalisation of manufacturing,<sup>65</sup> while stakeholders also highlighted that large defence primes seem to be deprioritising continuous improvement of capabilities and costs.<sup>66</sup> In a recent BEIS survey of aerospace companies in the UK (including those doing defence work), respondents believed that as a result

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‘Space X is a good example. [...] They have disrupted the market place in the way their business model works and are very high tech, very agile... fast moving... quick to respond. How could we capitalise on what they do and bring this into Defence? Defence is quite regulated and struggles with taking the good things done in other sectors and applying them to Defence.’ (INT A21)

of existing structural and cultural challenges to embracing innovation, current defence manufacturing capabilities and defence aircraft technologies were lagging behind near-peer competitors and could prevent the UK from accessing future export opportunities.<sup>67</sup> One stakeholder highlighted the potential productivity gains of Defence moving away from focusing solely on technology readiness levels (TRLs) when developing defence equipment, and towards equal emphasis on innovative manufacturing, maintenance and service support systems for equipment.<sup>68</sup> This would entail investing in advanced manufacturing processes as part of major defence procurement programmes.<sup>69</sup> Another stakeholder suggested that the defence sector lacks a ‘menu system’ for innovation that tailors recommendations on equipment and processes to companies.<sup>70</sup>

In the long run, low proactive investment in the manufacturing readiness of suppliers could narrow the UK’s competitive edge vis-à-vis major European defence producing countries like France and Germany, with primes such as Safran actively pursuing the ‘Factory of the Future’.<sup>71</sup> Moreover, it often takes several years to adapt manufacturing capabilities within a company, meaning companies may not have the agility to develop novel manufacturing capabilities in response to a particular MOD tender without sufficient lead times.<sup>72</sup> Advanced manufacturing processes themselves take time to test, refine and develop the reliability required before they are able to generate envisaged benefits. In addition, implementing innovative manufacturing practices is not simply a matter of procuring new

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‘At the moment, if you want a part/tool, you go to a window, ask for it, someone will go get it, scan it, give it to you, etc. – 11,000 manhours wasted each year to collect tools. We’re working to introduce technology on this. [...] Adaptation is a slow process. The aircraft manufacturing regulations are really difficult. To get any new technology introduced takes a very long time.’ (INT B18)

technology and equipment, but involves a complex process of matching new manufacturing capabilities with the requisite skills and redesigning processes to fully leverage new means of production.<sup>73</sup> Such practices have demonstrated their utility in driving productivity and efficiency in the commercial sector and, where they have been applied, also in the defence sector.<sup>74</sup>

### UK defence supply chains encounter difficulties in enforcing and monitoring cyber accreditations across all tiers

The final major area in which UK defence supply chains encounter challenges is in enforcing and monitoring cybersecurity standards.<sup>75</sup> A large share of defence suppliers still do not hold ‘cyber essentials’ accreditation and amongst those that do, many do not meet all the standards, which increases supply chains’ overall cyber threat vulnerability.<sup>76</sup> While some primes are behind on cyber requirements, the lower-tier suppliers constitute the majority of defence companies that do not hold them.<sup>77</sup> The additional burden of verifying and enforcing certifications acts as another disincentive to primes and Tier 1 companies, including non-traditional suppliers in their supply chains. Below are the factors contributing to this challenge:

- **The process of accreditations puts financial pressure on lower-tier companies** that are resource-constrained, which could explain the low uptake of cyber accreditations;<sup>78</sup>
- **Lower-tier companies can also underestimate the cyber threat environment** and the cascading impact a cyber threat could have on an integrated supply chain;<sup>79</sup>

- **Companies may lack cyber strategies at the business level**, which can contribute to failure to recognise and report cybersecurity breaches.<sup>80</sup>

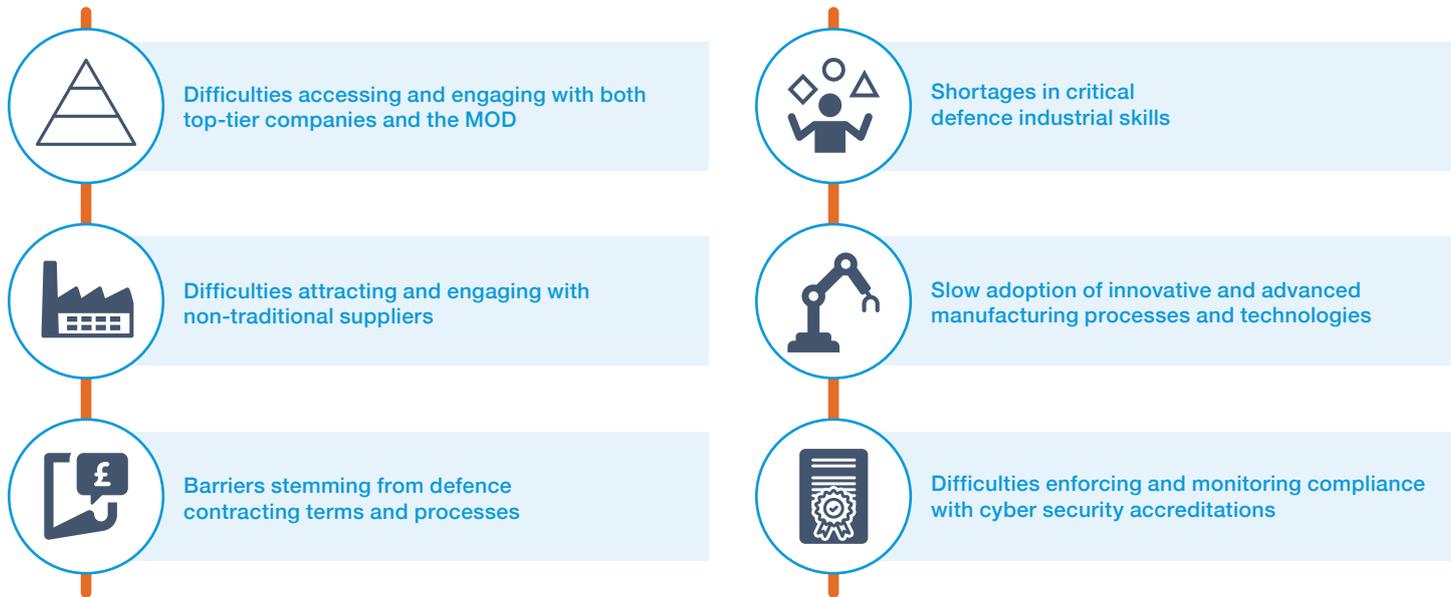
### Summary

This paper has identified six challenges faced by UK defence supply chains that can, without intervention, lead to missed opportunities to enhance competitiveness, productivity, resilience and capacity for innovation. These challenges are summarised in Figure 2.

Missed opportunities could undermine both the quality of defence capabilities and the value brought by defence R&D and manufacturing to the UK taxpayer. Non-traditional suppliers could bring operationally advantageous capabilities to Defence that are as yet unknown. Many such suppliers are also from lower-tier suppliers and can be dissuaded from joining defence supply chains due to high barriers to entry. In addition, while the UK is home to a world class and highly acclaimed education system, the defence sector consistently encounters challenges in attracting skilled talent to its supply chains. There is room for improvement in terms of developing not only the STEM skills required for defence programmes, but also the defence acumen and leadership skills required to enhance the competitiveness of UK defence supply chains.

UK defence supply chains also face procedural barriers that remain inflexible to the inclusion of lower-tier and non-traditional suppliers with potential to enhance the productivity of defence programmes. Although there is a genuine difficulty in enforcing and tracking cyber and other necessary accreditations throughout defence supply chains, the high regulatory burden associated with security

Figure 2. Challenges to defence supply chain productivity



requirements in the defence sector can also contribute towards a culture, shared by both the MOD and defence industry, that is slow to embrace innovative manufacturing processes and technologies.

Understanding and mitigating these underlying challenges is important to not only improve the productivity of UK defence supply chains, but also help ensure that the UK's defence industrial base remains capable of delivering high-quality defence capabilities needed to address tomorrow's threats and that also benefit the taxpayer and the wider economy. Luckily, supply chain development initiatives would not require reinventing the wheel, given the

progress that has already been made in this area by existing tools and programmes, and good practice that exists in other sectors (e.g. automotive, civil aerospace) and countries (e.g. US, France).

It should also be noted that the UK government has already sought to promote SME engagement with the defence supply chain through several initiatives that specifically seek to support lower tier suppliers. These include:

- **Small- and Medium-sized Enterprise Action Plan** to encourage SME participation throughout the defence supply chain,<sup>81</sup> which outlines MOD's **Strategic Partnering Programme**, in which the

MOD's 19 strategic suppliers (mostly primes) appoint an SME Champion to improve engagement<sup>82</sup>, and the **Defence Suppliers Forum**, which is a forum for strategic engagement between MOD, primes, mid-tier, and SME suppliers;<sup>83</sup>

- **Security Export Strategy**, which offers SMEs advice on financial opportunities, and promotes connections within the sector<sup>84</sup>;
- **SME Searchlight** launched by the Defence Science and Technology Laboratory (Dstl), to encourage non-traditional defence SMEs to engage with the MOD.<sup>85</sup>

As part of the project carried out by RAND Europe for the MOD, the RAND team developed two pilot concepts that seek to contribute towards addressing the challenges set out in this report. Critically, the pilots will support other government initiatives and, it is hoped, derive synergy through mutual reinforcement. The UK government could consider reinforcing or bolstering some of these options to address the identified supply chain development challenges, as well as helping the defence sector adopt and leverage Industry 4.0 technologies to enhance supply chain productivity and competitiveness.

## Notes

<sup>1</sup> Stakeholder and expert interviews have been anonymised and are identified using a coding convention with the prefix INT.

<sup>2</sup> House of Commons (2018)

<sup>3</sup> INT A2; INT A6; INT A8; INT A9; INT A15; INT A17; INT A19

<sup>4</sup> According to some measures, the UK's naval shipbuilding sector is only performing at approximately half the productivity of the UK's Western European counterparts (see Royal Haskoning DHV (2019)), while by some measures, the UK aerospace sector is the most labour productive sector in Europe with a 20 per cent margin on its French and German counterparts (see ATI (2018)).

<sup>5</sup> Lye (2020)

<sup>6</sup> PwC (2020); Deloitte (2020)

<sup>7</sup> INT A22

<sup>8</sup> INT A2; INT A3; INT A7; INT A8; INT A10; INT A12; INT A14; INT A17; BEIS (2016)

<sup>9</sup> INT A2

<sup>10</sup> INT A10; INT A22

<sup>11</sup> INT A10; INT A22; INT B15

<sup>12</sup> BEIS (2016)

<sup>13</sup> ATI and Fathom Consulting (2016)

<sup>14</sup> ATI and Fathom Consulting (2016); INT C2; INT C5; INT C6; INT C8

<sup>15</sup> INT A21

<sup>16</sup> INT A22

<sup>17</sup> Office of Small Business Programs (n.d.1)

<sup>18</sup> US Department of Defense (2019)

<sup>19</sup> The DoD's most recent Small Business Strategy called for further centralisation of its efforts to engage small business, see US Department of Defense (2019)

<sup>20</sup> US Small Business Administration (n.d.1)

- <sup>21</sup> Office of Small Business Programs (n.d.4)
- <sup>22</sup> Examples include: DARPA Small Business Programs Office (SBPO), the Office of Naval Research Office of Small Business Programs, Air Force Research Lab's Small Business Office (AFRL/SB), and US Special Operations Command (USSOCOM) Office of Small Business Programs (OSBP)
- <sup>23</sup> US Department of Defense (n.d.1)
- <sup>24</sup> Office of Small Business Programs (n.d.1)
- <sup>25</sup> Office of Small Business Programs (n.d.1)
- <sup>26</sup> US Department of Defense (2020)
- <sup>27</sup> INT A1; INT A3; INT A7; INT A8; INT A9; INT; INT A13; INT A14
- <sup>28</sup> INT A1; INT A7; INT A8; INT A9; INT A12; INT A20
- <sup>29</sup> INT; INT A3; INT A18; INT B12; INT B17; INT A22
- <sup>30</sup> INT A1; INT A7; INT A8; INT A9; INT A12; INT A20
- <sup>31</sup> INT A1; INT A3; INT A18; INT B12; INT B17
- <sup>32</sup> INT A9
- <sup>33</sup> INT A14
- <sup>34</sup> INT A3; ATI (2019)
- <sup>35</sup> INT A22
- <sup>36</sup> INT B15; INT C5; External RAND Europe workshop, 7 December 2020
- <sup>37</sup> INT A22
- <sup>38</sup> RAND internal workshop 1: Characterising the UK Defence Environment, 19 February 2020; INT A1; INT A15; INT A16
- <sup>39</sup> INT B17
- <sup>40</sup> INT A20; INT A22 B12
- <sup>41</sup> INT A22; INT A20
- <sup>42</sup> INT B17
- <sup>43</sup> INT C8
- <sup>44</sup> INT A21
- <sup>45</sup> INT A20
- <sup>46</sup> INT A20
- <sup>47</sup> INT A20
- <sup>48</sup> INT A21
- <sup>49</sup> Muravska et al. (2019); INT A3; INT A5; INT A6; INT A7; INT A9; INT A12; INT A13; INT A14; INT A15; INT A16; INT A17; INT A21
- <sup>50</sup> HM Government (2016); House of Commons Committee of Public Accounts (2018)
- <sup>51</sup> INT A19
- <sup>52</sup> Muravska et al. (2019); BEIS (2016); INT A5; INT A7; INT A9; INT A12; INT A15; INT A17; INT A19; INT A21
- <sup>53</sup> NAO (2020)
- <sup>54</sup> Royal Aeronautical Society (2020); ADS Group (2020); Muravska et al. (2019)
- <sup>55</sup> BEIS (2016)
- <sup>56</sup> Royal Haskoning DHV (2019)
- <sup>57</sup> INT A17
- <sup>58</sup> RAND internal workshop 1: Characterising the UK Defence Environment, 19 February 2020; INT A13; INT A15; INT A17
- <sup>59</sup> Galai et al. (2019); INT A6; INT A7
- <sup>60</sup> BEIS (2016)
- <sup>61</sup> RAND internal workshop 1: Characterising the UK Defence Environment, 19 February 2020; INT A5; INT A14; INT A16
- <sup>62</sup> INT A16
- <sup>63</sup> INT A4; INT A5; INT A 18; BIS (2016b)
- <sup>64</sup> ATI (2019a)
- <sup>65</sup> INT C2; INT C3; INT A21
- <sup>66</sup> INT A4; INT A5; INT A 18
- <sup>67</sup> BEIS (2016)
- <sup>68</sup> INT C3

- <sup>69</sup> INT C3
- <sup>70</sup> INT C5
- <sup>71</sup> Safran (n.d.)
- <sup>72</sup> INT C2
- <sup>73</sup> INT C2
- <sup>74</sup> University of Cambridge (2020)
- <sup>75</sup> INT A3; INT A7; INT A8; INT A9; INT A12; INT A15; INT B3
- <sup>76</sup> INT A7; INT A9; Taylor & Lucas (2020)
- <sup>77</sup> INT A7
- <sup>78</sup> INT A15; Taylor & Lucas (2020)
- <sup>79</sup> INT B3
- <sup>80</sup> INT A3; INT A8; INT B3
- <sup>81</sup> MOD (2019b)
- <sup>82</sup> MOD (2019b)
- <sup>83</sup> MOD (n.d.)
- <sup>84</sup> MOD (2019a)
- <sup>85</sup> Dstl (2019)

## References

- ADS Group. 2020. 'Defence Engineering: Tackling the Skills Shortage.' As of 17 February 2021: <https://www.adsgroup.org.uk/blog/defence/defence-engineering-tackling-the-skills-shortage/>
- Air Force Research Lab Small Business Hub (AFRL/SB). N.d. 'AFRL Small Business Office.' [afrlsbhub.com](https://afrlsbhub.com/afrlsbo/). As of 17 February 2021: <https://afrlsbhub.com/afrlsbo/>
- Aerospace Technology Institute (ATI). 2018. UK Aerospace Productivity Growth Strong, but Uneven. (Unpublished source)
- . 2019. Insight 11 Global Aerospace Patents: Technology, Innovation and Competitive Strategy. [Ati.org.uk](https://www.ati.org.uk/media/o5zjy32j/insight_11-global-aerospace-patents-1.pdf). April. As of 16 June 2020: [https://www.ati.org.uk/media/o5zjy32j/insight\\_11-global-aerospace-patents-1.pdf](https://www.ati.org.uk/media/o5zjy32j/insight_11-global-aerospace-patents-1.pdf)
- Aerospace Technology Institute and Fathom Consulting. 2016. Raising Ambition for UK Industrial Strategy (unpublished).
- Defense Advanced Research Projects Agency. N.d. 'The Small Business Programs Office.'. As of 17 February 2021: <https://www.darpa.mil/work-with-us/for-small-businesses/get-started-continued>
- Department for Business, Energy and Industrial Strategy (BEIS). 2016. UK Aerospace Supply Chain Study. BIS Research Paper Number 294, July. As of 17 February 2021: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/536903/bis-16-310-aerospace-supply-chain-study.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/536903/bis-16-310-aerospace-supply-chain-study.pdf)
- Defence Science and Technology Laboratory (Dstl). 2019. 'Defence Science and Technology Laboratory launches 'SME Searchlight' to harness innovation.' [Gov.uk](https://www.gov.uk/government/news/defence-science-and-technology-laboratory-launches-sme-searchlight-to-harness-innovation). As of 1 March 2021: <https://www.gov.uk/government/news/defence-science-and-technology-laboratory-launches-sme-searchlight-to-harness-innovation>
- Deloitte. 2020. 'COVID-19's impact on the aerospace and defense sector. Guidance for aerospace and defense executives'. [Deloitte.com](https://www2.deloitte.com/global/en/pages/about-deloitte/articles/covid-19/understanding-covid-19-impact-on-aerospace-and-defense.html). As of 19 June 2020: <https://www2.deloitte.com/global/en/pages/about-deloitte/articles/covid-19/understanding-covid-19-impact-on-aerospace-and-defense.html>
- Federation of Small Businesses (FSB). 2019. Taking Off: Opening up defence procurement for small businesses. [Fsb.org.uk](https://www.fsb.org.uk/resources-page/taking-off-opening-up-defence-procurement-for-small-businesses-pdf.html). As of 17 June 2020: <https://www.fsb.org.uk/resources-page/taking-off-opening-up-defence-procurement-for-small-businesses-pdf.html>

- Galai, Katerina, Lucia Retter, Julia Muravska, Marta Kepe, Alice Lynch, Anna Knack, Jacopo Bellasio, Antonia Ward, Arya Sofia Meranto, Davide Maistro, Liga Baltina & Terence Hogarth. 2019. *Vision on Defence-Related Skills for Europe Today and Tomorrow*. Cambridge, UK: RAND Corporation. EP-67991. As of 17 February 2021: [https://www.rand.org/pubs/external\\_publications/EP67991.html](https://www.rand.org/pubs/external_publications/EP67991.html)
- HM Government. 2016. *National Cyber Security Strategy 2016–2021*. As of 17 February 2021: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/567242/national\\_cyber\\_security\\_strategy\\_2016.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/567242/national_cyber_security_strategy_2016.pdf)
- House of Commons Committee of Public Accounts. 2018. *Skill Shortages in the Armed Forces*. HC 1027. As of 17 February 2021: <https://publications.parliament.uk/pa/cm201719/cmselect/cmpubacc/1027/1027.pdf>
- Lye, Harry. 2020. 'Expect shrinking budgets and change of military focus: Globsec on Covid-19'. *Army-technology.com*. As of 19 June 2020: <https://www.army-technology.com/features/expect-shrinking-budgets-and-change-of-military-focus-globsec-on-covid-19/>
- Ministry of Defence. N.d. 'Defence Suppliers Forum'. *Gov.uk*. As of 24 July 2020: <https://www.gov.uk/government/groups/defence-suppliers-forum>
- . 2019a. 'Security export strategy: growing UK exports for global security.' *Gov.uk*. As of 1 March 2021: <https://www.gov.uk/government/publications/security-export-strategy-growing-uk-exports-for-global-security/security-export-strategy-growing-uk-exports-for-global-security>
- . 2019b. *Small and Medium-sized Enterprise Action Plan: 2019-2022*. MOD. As of 24 July 2020: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/793101/20190405\\_SME\\_Action\\_Plan\\_2019.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/793101/20190405_SME_Action_Plan_2019.pdf)
- Muravska, Julia, Alice Lynch, Jacopo Bellasio, Anna Knack, Katerina Galai, Marta Kepe, Antonia Ward, Arya Sofia Meranto, Davide Maistro & Martin Hansen. 2019a. *Annex to Report: Vision on Defence-Related Skills for Europe Today and Tomorrow*. Cambridge, UK: RAND Corporation. EP-68005. As of 17 February 2021: [https://www.rand.org/pubs/external\\_publications/EP68005.html](https://www.rand.org/pubs/external_publications/EP68005.html)
- . 2019b. *Defence Industrial Skills Strategy and Implementation Roadmap* (unpublished).
- National Audit Office (NAO). 2020a. *Ministry of Defence, Defence Capabilities – Delivering What Was Promised*. Report by the Comptroller and Auditor General. *Nao.org.uk*. As of 17 February 2021: <https://www.nao.org.uk/report/defence-capabilities-delivering-what-was-promised/>
- Office of Naval Research (ONR). N.d. 'Office of Small Business.' *Onr.navy.mil*. As of 17 February 2021: <https://www.onr.navy.mil/en/work-with-us/small-business>
- Office of Small Business Programs (OSBP). N.d.1. 'Mentor-Protégé Program (MPP).' *Business.defense.gov*. As of 17 February 2021: <https://business.defense.gov/Programs/Mentor-Protége-Program/>
- . N.d.2. 'Small Business Program Goals & Performance.' *Business.defense.gov*. As of 17 February 2021: <https://business.defense.gov/About/Goals-and-Performance/>
- . N.d.3. 'Home Page.' *Business.defense.gov*. As of 17 February 2021: <https://business.defense.gov/>
- . N.d.4. 'HUBZones.' *Business.defense.gov*. As of 17 February 2021: <https://business.defense.gov/Small-BUusiness/HUBZones>
- . N.d.5. 'DoD Small Business Offices.' *Business.defense.gov*. As of 17 February 2021: <https://business.defense.gov/Small-Business/DoD-Small-Business-Offices/>
- PwC. 2020. *Where next for Defence? COVID-19: UK industry focus*. *Strategyand.pwc.com*. As of 19 June 2020: <https://www.strategyand.pwc.com/uk/en/reports/strategy-where-next-for-defence.pdf>
- Royal Aeronautical Society. 2020. 'Addressing the UK Cyber Skills Gap.' As of 17 February 2021: <https://www.aerosociety.com/news/addressing-the-uk-cyber-skills-gap/>
- Royal Haskoning DHV. 2019. *UK Shipbuilding Competitiveness and Market Focus Final Report* (unpublished source).
- Safran. n.d. 'Factory of the Future.' *usinedufutur.safran-group.com*. As of 17 February 2021: <https://usinedufutur.safran-group.com/en/>
- Special Operations Forces Acquisition, Technology, & Logistics (SOF AT&L). N.d. 'Office of Small Business Programs.' *Socom.mil*. As of 17 February 2021: <https://www.socom.mil/SOF-ATL/Pages/small-business.aspx>
- Taylor, Trevor & Rebecca Lucas. 2020. 'Management of Cyber Security in Defence Supply Chains.' *RUSI Newsbrief 40 (3)*. *Rusi.org*. As of 17 February 2021: [https://rusi.org/sites/default/files/lucas\\_and\\_taylor\\_final.pdf](https://rusi.org/sites/default/files/lucas_and_taylor_final.pdf)

University of Cambridge. 2019. 'The role of industrial digitalisation in post-Covid-19 manufacturing recovery, diversification and resilience.' As of 1 March 2021:  
<https://www.ciip.group.cam.ac.uk/reports-and-articles/role-industrial-digitalisation-post-covid-19-manuf/download/2020-10-08-DigitalBR.pdf>

US Department of Defense (US DoD). 2019. Small Business Strategy. October. As of 17 February 2021:  
<https://business.defense.gov/Portals/57/Documents/Small%20Business%20Strategy.pdf?ver=2019-11-19-115847-510>

## About This Perspective

In this Perspective, the authors discuss cross-cutting challenges and barriers faced by small and medium-sized companies attempting to enter and operate in the UK's defence market. These obstacles can diminish the productivity and competitiveness of UK defence supply chains and have been identified by RAND Europe researchers as part of a larger, overarching study conducted for the Ministry of Defence on policy options to support and develop defence supply chains. The challenges and needs presented here draw heavily on the research team's discussions with dozens of stakeholders and experts across industry, government, and the wider public sector.

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## About the Authors

**Julia Muravska** is a Research Leader within the Defence, Security and Infrastructure Programme at RAND Europe. Leading projects on a range of topics in defence, Julia combines cross-domain expertise in

defence capabilities, industry, and policy with wide-ranging experience in research management and design. She led the RAND Europe study on defence supply chains from which this Perspective is derived.

**Anna Knack** is an Analyst in the Defence, Security and Infrastructure team at RAND Europe. Anna's research focus is on defence industrial base issues and defence futures. She is the Deputy Lead of the Technology, Disruption & Uncertainty workstream and was the project manager for the study Defence Supply Chain Development.

**Rebecca Lucas** is an Analyst with the Defence, Security and Infrastructure team. She has spent her career in the defence sector at institutions including the Royal United Services Institute (RUSI) and Booz Allen Hamilton. She has an MA from Georgetown University and is pursuing a PhD at King's College London.

**Ben Williams** is a former Senior Research Leader within the Defence, Security and Infrastructure Programme at RAND Europe. His primary research interests include defence acquisition, industrial policy, deterrence, science and technology and pharmaceuticals. He recently led multiple major projects in the areas of arms control and proliferation, defence supply chains, technology watch and horizon scanning, primarily for the UK MOD.

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