Annex G: Netherlands

Annex to report: Vision on defence related skills for Europe today and tomorrow

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Defence-related skills:
Building evidence on skills shortages, gaps and mismatches and defining the sector’s strategy on skills
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## Figure G.1 Executive summary – Netherlands

### Netherlands

<table>
<thead>
<tr>
<th>DITB size</th>
<th>Turnover €4.5B; ~ 24,800 employees; comprised of 651 companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain focus</td>
<td>Largely manufactures domain-agnostic sub-systems and components</td>
</tr>
<tr>
<td>Defence capabilities</td>
<td>ICT, sensors, software, simulations, electronics, containers, propulsion systems, missiles, weapons</td>
</tr>
<tr>
<td>Exports</td>
<td>Over €3B, with 84.4% of exports being parts and components for weapons and ammunition</td>
</tr>
<tr>
<td>Selected companies</td>
<td>Damen, Thales ND, Fox-IT. NDTIB is largely made up of SMEs that cover subsystems across all domains</td>
</tr>
</tbody>
</table>

#### Identified skills gaps and challenges
- There is a shortage in STEM skills due to the lack of young people entering careers in the relevant STEM fields
- Gaps include: engineers with specialisms in mission systems, systems testing, advanced materials, synthetic environments, safety, advanced development, electrical, AI and autonomous systems, radar systems, mechanical and thermal.
- Additionally, specialists in information architecture and cyber threat management, software developers, ethical hackers, maintenance personnel, technicians and trainers.

### Skills supply landscape

<table>
<thead>
<tr>
<th>National skills strategy</th>
<th>Includes defence skills?</th>
<th>Education programmes</th>
<th>Other top down initiatives</th>
<th>Industry-led initiatives</th>
<th>Collaborative initiatives</th>
<th>Investment in R&amp;D?</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Skills focus
- Design and engineering (aerospace, computer, electrical, materials science, mechanical), marine technology, management
- Engineering (space, mechatronics, aerospace), technical skills
- Engineering (mechanical, radar, electronic), marine technology, offshore and dredging, cloud security, cyber, software, computer science, 3D simulations, gaming, virtual reality
- Invests in talent to augment R&D capability in technological niches

#### Examples
- Netherlands Defence Academy Faculty of Military Sciences Bachelor programme, Royal Institute for the Navy Military Scientific Training, ‘DARE’ Aerospace Rocket Engineering, TU Delft Aerospace Engineering MSc
- VEVA Defence-specific Vocational Training Programme, NLR Internship programme
- Netherlands Maritime Technology Training; Damen Traineeship Programme; FoxAcademy; Fokker Technologies; TU Delft and Lockheed Martin Internship Programme; EC Council Certified Ethical Hacker Programme, KMWE Traineeship
- TNO Traineeship, TNO Internship

Source: RAND Europe
G.1. Background

In the Netherlands, defence budget cuts after the financial crisis precipitated the Dutch Ministry of Defence (MinDef)’s recent preference for procuring off-the-shelf where possible, but simultaneously investing in talent to augment R&D capability in technological niches. The Dutch defence budget is set at €9.7 billion for 2018, (approximately 1.2% of GDP), so typically the Dutch government strategically invests its limited resources in the Dutch DTIB’s areas of technical strength in order to boost the competitiveness of Dutch industry and maintain the indigenous skills base. The local DTIB is largely comprised of dual-use enterprises and research institutions with some defence-specific business segments. The Dutch DTIB includes a few global companies’ subsidiaries and one original equipment manufacturer (OEM).

The Dutch DTIB is comprised of 650 companies employing approximately 24,800 staff. Based on the latest quantitative data provided on a voluntary basis to the government, and the latest figures published by the Netherlands Industries for Defence and Security (NIDV), turnover in 2014 for the DTIB was valued at €4.54 billion with around 68 per cent of that total revenue originating from exports. Dutch defence manufacturing capabilities include frigates and corvettes, aerospace structures (feeding into global supply chains for multinational programmes), as well as weapons and ammunition, but many of the industry’s innovative strengths arguably lie in sub-systems and components with applications in the maritime, aerospace and cyber domains. Another area of particular strength is parts and components for weapons and ammunition, comprising 84.4 per cent of recent exports.

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Defence industrial skills landscape in selected EU Member States

Figure G.2 Overview of export licenses issued in the Netherlands in 2016

Source: Ministry of Foreign Trade and Development Cooperation and Ministry of Foreign Affairs (2016)

G.1.1. Key industry players

With the exception of a few major companies such as Damen, Thales Netherlands, Fokker Technologies and Fox-IT, the Dutch DTIB is largely made up of SMEs. They cover a wide range of skills and capabilities:

- Aircraft
- Aircraft ground support
- Ammunition
- Armoured vehicles
- Ballistic protection
- Containers
- Education and training
- Electronics
- IT hardware
- Logistics
- Military engineering materiel
- Missiles
- Transport systems
- Weapons
- Naval equipment
- Power supply
- Propulsion techniques
- Security scanners
- Sensors
- Simulations
- Software
- Telecommunications

Damen is the only remaining OEM. The most prominent industry association is the NIDV, which represents around 350 active (predominantly SME) Dutch companies. Additionally, the Netherlands Aerospace Group (NAG) represents over 100 defence companies that make up the Dutch aerospace cluster, though this considers also civil aviation markets.9

Table G.1 Selected Dutch defence companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Focus area</th>
<th>Number of employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damen</td>
<td>Naval military and civil surface vessels, corvettes</td>
<td>3,500</td>
</tr>
<tr>
<td>Thales Nederland</td>
<td>Naval defence systems</td>
<td>1800</td>
</tr>
<tr>
<td>Fox-IT</td>
<td>Cyber</td>
<td>300</td>
</tr>
<tr>
<td>Fokker Technologies</td>
<td>Aerostructures, electrical wiring systems, landing gear</td>
<td>-</td>
</tr>
<tr>
<td>Aeronamic</td>
<td>Aircraft, helicopters, unmanned aerial vehicles components</td>
<td>160</td>
</tr>
</tbody>
</table>

The Netherlands is a Tier 2 partner in the F-35 programme. Around 25 Dutch industry suppliers have generated over €849 million in high volume production, technology development and structural design contracts for the Netherlands.

G.2. Overview of skills gaps and shortages

The defence sector is one of many industries affected by the Dutch education system’s difficulties in drawing young people towards STEM disciplines, so there is a generally low availability of STEM skills, particularly in engineering skills. The F-35 programme will however likely generate sustained demand in aeronautics and avionics engineering skills for the foreseeable future, as the DTIB is planned to continue building F-35 parts for a global fleet of more than 3,000 aircraft over the next 30+ years. Due to an exponentially growing skills demand in new technology areas, there is a particularly acute shortage in cyber skills. The challenge of finding skilled personnel to work in cyber is further complicated by a shortage in instructors with cyber skills as these professionals tend not to be attracted to academic employment. Although the Netherlands is increasingly establishing cyber skills programmes, there is a reported skills shortage in cyber skills as new programmes are only beginning to feed into demand. With the majority of programmes aimed at developing dual-use skills, rather than cyber defence, there is a lack of defence-specific skills programmes. In addition, due to the Dutch DTIB’s strong focus on dual-use technologies more widely, and market demand for skills that specialise in emerging technologies and environmental technology, many companies are pursuing business expansion in automation, autonomous vehicles and green technology. This is creating a wider shortage of skills that specialise in autonomous naval vessels, AI systems, virtual reality, data scientists for Big Data integration and green engineering or e-engineering skills.

Specifically, the local DTIB is experiencing a reported shortage in skills in:

- **Design and engineering** with specialisms in aerospace engineering, mission systems design, systems test engineering, materials engineering, framework/chassis engineering, detail and installation designers, synthetic environments engineering, design engineering, shipbuilding, avionics, aeronautics, mechanical engineering, electrical engineering, systems engineering, structural design, radar systems, automation mechatronics, nanotechnology, digital engineering, green engineering, obsolescence engineering, integration, and AI systems;

- **Project management** in cost estimation, procurement, safety and governance, support services, structures engineering, compliance, draughtsmanship and CAD design, configuration, testing, logistics, defence economics, sales, business development, quality control, digitalisation and autonomy;

- **Software development and engineering**, particularly in 3D simulations, virtual and augmented reality, gaming and combat management testing;

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10 Lockheed Martin. n.d.' F-35 Lightning II for the Netherlands.' As of 25 September 2018: https://www.f35.com/global/participation/netherlands
Defence industrial skills landscape in selected EU Member States

- **Cyber** including skills in information architecture, cyber threat management, information security and ethical hacking;
- **Maintenance and services** including mechanics, welders, sheet metal workers and technicians;
- **Training design and delivery.**

In the Netherlands, industry stakeholders perceived skills shortages to be more prominent than skills gaps. The skills that the industry finds most difficult to supply quickly enough for its needs include **information architecture, support services management, systems engineering, system test engineering and safety and governance management.** Other notable skills shortages that ranked less highly, but that are nevertheless worthy of attention include **maintenance engineering, materials engineering, structures engineering, framework/chassis engineering, compliance, training design and delivery, draughtsmanship and CAD design, autonomy engineering, synthetic environments engineering, project management, procurement and design engineering.**

Skills gaps that will continue to be difficult to access now and in five to ten years include **procurement, electrical and control design and electrical and control engineering.** Some identified skills gaps were projected by Dutch industry stakeholders to be felt in ten years, though may not be as discernible in five years. Specifically, skills gaps that will be more prominent in ten years, though less prominent in five years include cost estimation, procurement, project management, planning and production support engineering, design validation, draughtsmanship and CAD design, naval architecture and marine engineering, training design and delivery, mechanical/fluids design, mechanical and thermal engineering, framework/chassis engineering, support services management, systems engineering, design validation engineering, systems test engineering, materials engineering and maintenance engineering.

G.3. National and regional policies and programmes

G.3.1. Overview of national and regional policies

The Netherlands pursues a high-quality knowledge infrastructure by:

- **Promoting a ‘Triple Helix’ approach** that encourages regular and institutionalised collaboration between the government, knowledge institutions and industry;
- **Providing clear guidance on technology priority areas** to raise awareness among and direct Triple Helix partners’ resources;
- **Prioritising investment in the Netherlands’ most competitive sectors,** by investing in R&D, and particularly the human capital, in these competitive industries (See Figure G.2);
- **Aligning incentives and policy levers such as grand challenges and the ‘industrial participation’ tool with the objectives** of raising capability priorities on the agenda, identifying high-quality talent and ensuring that knowledge capital generated from defence programmes is spread across the Dutch industry and retained in the Netherlands.

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11 RAND Europe survey analysis (2018)
12 Ibid.
13 Ibid.
14 Ibid.
In the Netherlands, the Dutch DTIB’s interests are largely represented by the Ministry of Economic Affairs (MEA) as opposed to the MinDef.15 The government supports security clusters such as The Hague Security Delta, whose remit covers national security issues, urban security, forensics, cyber security and critical infrastructure.16 The cluster pursues strategic partnerships across the Triple Helix and projects that leverage the strengths of partners to tackle societal challenges including adequate access to talent, knowledge and human capital – also through the identification of funding sources to support innovation initiatives.17

The MinDef publishes priority technology areas in the Netherlands Defence Industry Strategy from which high-level demand for skills can be derived.18 The strategy aims to promote the competitiveness of the Dutch DTIB and ensure that the Dutch Armed Forces are equipped with the means to fulfil their military operational requirements. The publication of key technology priorities aids in directing the efforts of the DTIB in areas where limited resources will be most effective.19 The 2013 iteration of the strategy outlines the following technology priority areas, as both key operational capabilities and strengths of the local DTIB relative to that of other countries, from which high-level priorities for skills can be derived:

1. Integrated (sub-)system design and development;
2. Sensors, C4I and automation;
3. Advanced materials and components;
4. Simulation and simulators for education and training;
5. Electronic and information protection / weaponry.

The MinDef has also formulated a Knowledge and Innovation Policy which allocated € 62.5 million to the defence budget in 2017.20 This includes funds earmarked for support to defence-specific science and technology development and the skills required to sustain it in the technology priority areas stipulated in the Netherlands Defence Industry Strategy.21 The Dutch government has increasingly promoted the

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The development of a Smart Industry (SI) initiative since 2014. The aim of SI is to enhance the competitiveness of Dutch manufacturing industries by capitalising on existing knowledge streams and investing heavily in skills that contribute to advanced manufacturing. The government has earmarked €25 million for classroom-based and online dual-use skills development programmes under SI, which is further bolstered by €10 million in EU funding in line with national and EU-level recognition of the criticality of the need to access digital, cyber and STEM skills.

**Finally, Government incentives and policy levers are aligned with strategic objectives.** One of the government’s critical objectives is to ensure that any learning developed from defence programmes is retained in the Netherlands and benefits the Dutch economy. The MinDef’s procurement strategy emphasises procuring off-the-shelf where possible, and can mandate ‘industrial participation’ of Dutch manufacturers when foreign equipment is purchased. The prioritisation of cyber skills is also demonstrated in the *Defence Cyber Strategy 2015*, and the establishment of the Netherlands Defence Cyber Command, and will generate demand for cyber skills. Incentives such as the MinDef’s defence innovation challenges surrounding the theme of cybersecurity, for instance through the Defense Innovation Competition 2017, which awards €200,000 to winners, are also strategically designed to support the identification of talent in the Dutch DTIB’s priority areas.

G.3.2. Overview of national and regional programmes

In the Netherlands, the government and academia play a more prominent role in skills development than industry. However, public skills programmes are nonetheless implemented in close collaboration with industry. The Dutch DTIB is consulted in the formulation of the government’s strategic technology priorities, particularly through industry associations such as NIDV. Furthermore, industry funding and personnel that serve as instructors for university programmes are leveraged in public skills programmes.

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Table G.2 Overview of selected public skills programmes

<table>
<thead>
<tr>
<th>Programme</th>
<th>Career stage</th>
<th>Domain</th>
<th>Skills focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyber Security Academy(^{29})</td>
<td>Early-career professionals</td>
<td>C4ISTAR</td>
<td>Cyber</td>
</tr>
<tr>
<td>Defensity College Programme</td>
<td>Early-career professionals</td>
<td>Cross-domain</td>
<td>Cyber, technical skills, ICT, logistics, law, management, economics, communication</td>
</tr>
<tr>
<td>Netherlands Defence Academy Military Sciences programme</td>
<td>Early-career professionals</td>
<td>Cross-domain</td>
<td>Military systems, military management, military technology, military engineering</td>
</tr>
<tr>
<td>Royal Naval College(^{30})</td>
<td>Early-career professionals</td>
<td>Naval</td>
<td>Naval military scientific training</td>
</tr>
<tr>
<td>TU Delft Space Engineering Programme(^{31})</td>
<td>Early-career professionals</td>
<td>Space</td>
<td>Astrodynamics, space systems engineering</td>
</tr>
<tr>
<td>TU Delft ‘DARE’ Aerospace Rocket Engineering Programme(^{32})</td>
<td>Early-career professionals</td>
<td>Air</td>
<td>Aerospace engineering</td>
</tr>
<tr>
<td>TU Delft Aerospace Structures and Materials Programme(^{33})</td>
<td>Early-career professionals</td>
<td>Air</td>
<td>Aerospace engineering, advanced materials, aerospace structures and composites, aerospace computational mechanics</td>
</tr>
<tr>
<td>VEVA Defence-specific Vocational Training Programme</td>
<td>Early-career professionals</td>
<td>Cross-domain</td>
<td>Land-based vehicles, construction, security, ICT, logistics, land warfare, shipbuilding, mechatronics, airplane maintenance and military health</td>
</tr>
</tbody>
</table>

Source: RAND Europe

G.4. Industry-led policies and programmes

Industry associations such as the NIDV and NAG are particularly active in pursuing synergies with dual-use companies. The industry contributes to skills development by contributing funding to technical university programmes and offering vocational training and internship programmes for university

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\(^{29}\) Cyber Security Academy. n.d. 'Towards an integral approach to cyber security.' As of 25 September 2018: https://www.csacademy.nl/en/

\(^{30}\) Dutch Ministry of Defence. n.d.b. 'Royal Institute for the Navy.' As of 25 September 2018: https://www.defensie.nl/onderwerpen/defensieacademic/leiderschap/kim


\(^{33}\) TU Delft. n.d.c. 'Department of Space Engineering.' As of 25 September 2018: https://www.tudelft.nl/en/ae/organisation/departments/space-engineering/
students to enhance their theoretical learning with on-the-job training. NAG contributes to ‘Lucht en Ruimtevaart Nederland (LRN)’ - a foundation that involves industry, universities and trade associations active in the Dutch civil and defence aerospace industries, whose objective is to formulate a common vision to influence national policy for the overall benefit of Dutch aerospace.\footnote{France, Olivier, Luc Mampaey and Dick Zandee. 2016. ‘Defence industry policy in Belgium and the Netherlands.’ Armament Industry European Research Group, Policy Paper. As of 25 September 2018: http://www.iberglobal.com/files/2016-2/Defence-Policy-Belgium-NL.pdf} The Dutch DTIB also supports dual-use research institutes such as the Netherlands Organisation for Applied Scientific Research (TNO), the National Aerospace Laboratory (NLR) and the Maritime Research Institute of the Netherlands (MARIN).

To attract students to the sector, the industry actively recruits talent during events such as student career days in university campuses and awareness-raising events such as those organised under the EU cybersecurity month. Additionally, cyber skills can quickly become outdated due to the speed of technological change, so some universities encourage academics specialising in cyber to work part-time in industry in order to ensure that professors continue to develop currency as practitioners. The sharing of skilled cyber instructors across industry and academia contributes to the alignment of academic curricula with the skills demand generated by the cyber threat landscape and industry requirements. Another trend that has emerged due to the Netherlands’ competitiveness in environmental technology is the expansion of defence companies such as Damen into environmental technology business segments (ie. Damen Green Solutions), which is generating additional skills demand in breakthrough environmental technologies.

G.4.1. Overview of company defence related skills policies and programmes

Large defence companies and dual-use SMEs offer training programmes and internships in technical skills. Damen offers entry-level and mid-career traineeship programmes that develop dual-use mechanical engineering, marine technology, offshore and dredging and management skills.\footnote{Damen. n.d. ‘Students & Starters.’ As of 25 September 2018: https://career.damen.com/en/students} Fox-IT’s FoxAcademy similarly offers a range of cyber training courses dedicated to general cyber skills.\footnote{Fox IT. n.d. ‘FoxAcademy.’ As of 25 September 2018: https://www.fox-it.com/en/our-areas-of-expertise/foxacademy/} Thales Netherlands also offers programmes based on the ‘70/30 principle,’ with 70 per cent of the programme time allocated to learning-on-the-job and 30 per cent allocated to mentorship and coaching.

External training organisations also provide training that is accessible to employees of defence and dual-use SMEs. For example, Netherlands Maritime Technology offers 2-day technical training courses in naval-related engineering skills.\footnote{Netherlands Maritime Technology. n.d. ‘International training courses for maritime professionals.’ As of 25 September 2018: https://maritimetechnology.nl/en/projects/international-training-courses-for-maritime-professionals/} The company also offers mid-level career professionals employed in the shipbuilding industry design, engineering and management courses for maritime systems.\footnote{Netherlands Maritime Technology. n.d. ‘International training courses for maritime professionals.’ As of 25 September 2018: https://maritimetechnology.nl/en/projects/international-training-courses-for-maritime-professionals/} In the cyber
domain, the International Council of Electronic Commerce Consultants in the Netherlands offer a number of Ethical Hacking Certifications and training modules.39

Table G.3 Overview of selected industry programmes

<table>
<thead>
<tr>
<th>Programme</th>
<th>Career stage</th>
<th>Domain</th>
<th>Skills focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damen Traineeship Programme</td>
<td>Early-career pros.</td>
<td>Naval</td>
<td>Marine technology, offshore and dredging, mechanical engineering</td>
</tr>
<tr>
<td>Damen Business Course</td>
<td>Early-career pros.</td>
<td>Naval</td>
<td>Management</td>
</tr>
<tr>
<td>Fox-IT Fox Academy</td>
<td>Early-career pros.</td>
<td>Cyber</td>
<td>Cyber crisis management, cloud security, cybercrime attack and defend</td>
</tr>
<tr>
<td>Thales Netherlands Internship Programme</td>
<td>Early-career pros.</td>
<td>Cross-domain</td>
<td>Software systems, radar systems, electronic engineering, management, computer science, 3D simulations, gaming, virtual reality</td>
</tr>
<tr>
<td>Aeronamic Internship Programme</td>
<td>Early-career pros.</td>
<td>Air</td>
<td>-</td>
</tr>
<tr>
<td>Fokker Technologies</td>
<td>Early-carer pros.</td>
<td>Air</td>
<td>Aerospace engineering, advanced composites, future wing designs, energy storage</td>
</tr>
</tbody>
</table>

Source: RAND Europe

G.5. SWOT analysis of national and industry programmes

In the Netherlands, the supply of defence skills is broadly aligned with demand, due in great part to collaboration between government, industry and academia, as well as non-academic knowledge institutions. The government plays a key role by providing strategic leadership in the dissemination of information exchange over strategic priority areas and as a catalyst for resource and information exchange across the Triple Helix. This strategic coordination across partners aids in reducing duplication of efforts and maximising the efficiency of resource distribution. Despite these efforts, however, skill gaps persist in a range of important areas, including in relation to emerging technologies such as cyber. The prevalence of dual-use SMEs creates competition between the defence and commercial industries for skilled personnel, but also introduces additional skills pools. The relatively less prominent role that industry plays in skills programmes could also increase the risk of the emergence of skills gaps.

Figure G.3 Overview of export licenses issues in the Netherlands in 2016

Internal factors

<table>
<thead>
<tr>
<th><strong>Strengths</strong></th>
<th><strong>Weaknesses</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Explicitly stated and disseminated technology priority areas in identified relative strengths of the DTIB allows for the efficient use of limited resources to target areas in which the Dutch DTIB could be most effective. The government actively encourages the Triple Helix approach of collaboration between industry, academia and government, with the support of knowledge institutions such as dual-use research institutes. Publically funded educational programmes are aligned with the Netherlands Defence Industry Strategy’s technology priority areas, which could contribute to the alignment of the supply of skills to demand. Innovation clusters contribute to further acceleration of partnerships between Triple Helix on a range of innovation challenges including sustaining access to talent. Industry associations such as NIDV and NAG are effective in ensuring that SMEs with limited resources are able to influence Dutch technology prioritisation processes.</td>
<td>Industry plays a less prominent role in skills programmes, so has less input into programmes’ curricula. The Dutch model of defence innovation is dependent on the strategic leadership of government, so support for the defence industry and the development of defence-related skills can be susceptible to shifts in government priorities.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>External factors</strong></th>
<th><strong>Opportunities</strong></th>
<th><strong>Threats</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opportunities</strong></td>
<td>The shift towards more favourable public attitudes towards the defence industry could lead to more public acceptance of increased funding for the defence sector, and for programmes in defence-related skills. Since the Dutch DTIB is largely comprised of SMEs, privately-funded external training organisations could be leveraged by SMEs that may not have sufficient resources to offer expensive educational programmes.</td>
<td>Competition from the civil sector for skilled personnel threatens the supply of skills to the defence industry. The industry’s relatively limited input into programmes’ curricula could consequentially lead to delay in skills programmes’ adaptation to shifts in skills demand – particularly in an environment characterised by accelerated development of emerging technologies in the civil sector. Demand for cyber skills is increasing rapidly and could create a skills gap as newly-established cyber programmes struggle to cope with skills demand.</td>
</tr>
</tbody>
</table>

Source: RAND Europe