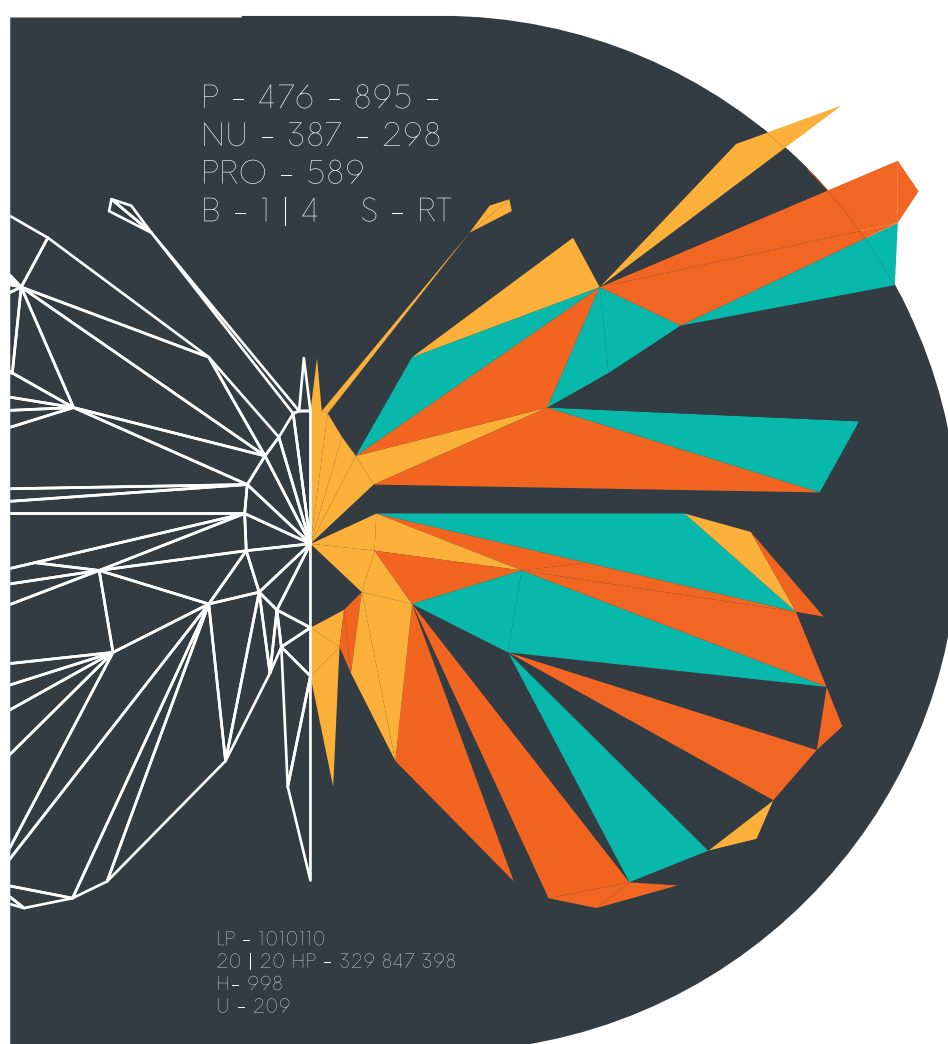


Data and Digital – A Continuous Evolution

An introduction to the BAE Systems portfolio of Data and Digital Services



Digital
Intelligence

BAE SYSTEMS

Introduction

From the moment we wake up to the moment we go to sleep, an increasing amount of what we do, both privately and professionally, is enabled by or dependent upon electronic digital activity. But this is not new. Our dependence upon electronic digital systems has been creeping up on us for decades.

In recent years, however it has accelerated, and technology's rapid advance shows no sign of abating. The fact is that organisations today cannot exist without being digitally capable, and will not succeed without being digitally advanced.

Virtually every organisation has had multiple attempts at transforming its operations, often fuelled by the allure and belief that 'going digital' is the be-all and end-all. But often the reality doesn't live up to expectations, and the results aren't quite so 'transformational'. So why does this happen, and what can be done?

The fact is that although technology is becoming ever more complex and sophisticated, the challenges faced by organisations looking to take advantage of going 'digital' have not significantly changed. There is no silver bullet. There may be quick wins, but unfortunately for those chasing the excitement of the shiniest, newest technologies, actual transformation also requires a more strategic, long-term, and frankly less immediately-inspiring effort.

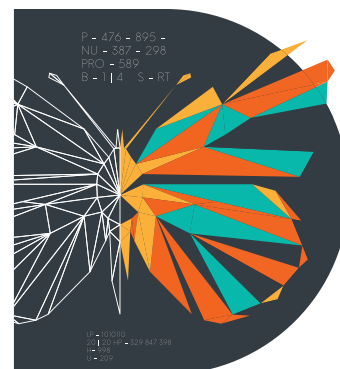
So, there is a balance to strike.

The things that organisations have been doing for years still need to be done. Data volumes are continuously increasing, and patterns of usage are changing as the post-pandemic world shifts to new ways of working. Legal and regulatory requirements are regularly adapted. Organisations' own IT estates become ever more complex and harder to manage and maintain. The year 2020 broke all records when it came to data lost in breaches and the sheer number of cyber-attacks on governments and commercial organisations. And, as always, no technology programme will be a success without an understanding and focus on the culture of an organisation.

Of course, everyone still wants to play with and benefit from what the new 'toys' can do. To retain the best employees and remain successful, organisations have to be able to take advantage of new technologies, tools and techniques whilst still handling the enduring challenges they present.

In this brochure we will:

- Look at the typical challenges within the digital transformation cycle (Client Challenges)
- Present an overview of how BAE Systems Digital Intelligence helps our clients address these challenges (How we Help.)



Client Challenges

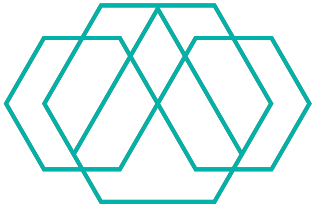
“ Currently around half of central government IT spend is on servicing legacy IT. Such an approach is not only expensive, it also poses cyber-security risk, and prevents agile ways of working and cross departmental interaction. It also obstructs the use of new innovative IT solutions and the sharing of data more openly. ”

Steve Barclay, Chief Secretary to the Treasury, July 2020

With the concerns raised in Mr Barclay's statement, not to mention the dizzying pace of digital advances, our clients often find themselves in a seemingly impossible situation – how can we reduce the cost and risk associated with managing our current landscape and prevent outdated IT hindering operations and service delivery, whilst also making sure we are well-placed to be innovative, fast-moving and able to take advantage of rapid improvements in technology?

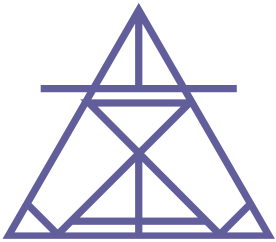


Some things just have to be done



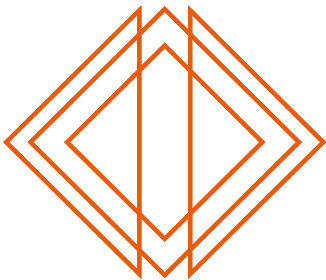
Dealing with exponentially increasing data volumes and new data patterns

The Covid-19 pandemic and its seismic impact on our way of life has only managed to increase this beyond what we have been tackling with for many years now. Organisations must continually work out how to manage all of this data - how to collect it, store it and process it - and they also now have to face up to the fact that historical pre-pandemic data may no longer be relevant or representative as a result of the shift in working patterns and our daily lives.



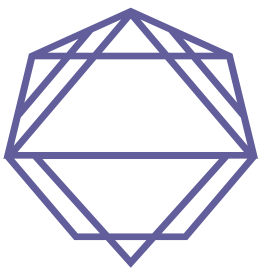
Handling all of this data legally and ethically

Legal and regulatory requirements governing the use of data are continually changing, and end users are becoming ever more switched on to, and concerned with, the deep reservoir of data that commercial and government departments possess. We cover the world with digital fingerprints, and the amount of information captured on individuals and their habits, including via app-enabled surveillance, has moved to unprecedented levels. As we adjust to this new reality, many organisations are realising they need to take accountability not only for their actions, but also those for the machines they employ. Organisations must make sure they are conversant with all relevant legal and regulatory frameworks, while also ensuring they are acting with integrity and that the ethics of their data usage are continually assessed and thoroughly understood.



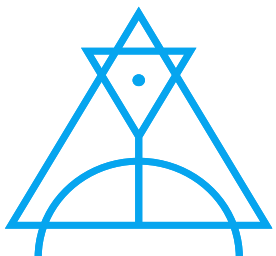
Maintaining and delivering change into extremely complex, layered IT estates

The sheer pace of technological advances quickly renders existing systems obsolete, resulting in government departments' IT estates being made up of a patchwork of technologies and layered systems which become ever more complex as new layers are added to old, each of which is often underpinned by hundreds of sub-systems and supported by multiple suppliers. The sheer age of most legacy IT estates ensures that many of their complexities remain hidden and are not well understood. Some of these legacy services cannot be easily transitioned to modern technology, and public sector organisations in particular are often quite risk averse, meaning that any change can be extremely time-consuming. This creates the need to maintain out of date platforms that cannot benefit from any of the increased agility that modern technology platforms and cloud environments offer.



Protecting existing systems from cyber threats

For the legacy IT that cannot be transitioned, retro-fitting cyber security defences may not be an option. Organisations will need to continually assess the potential for legacy systems to be compromised and the impact this could have, allowing them to take mitigating actions or proactively remove high risk assets before a vulnerability can be exploited within their IT estate.



Focusing programmes on people not technology

A focus on technology will always fail. Digital transformation is more than just a single programme of change, it is a way of operating, a culture in itself. A state of perpetual movement where you can't just tick one programme off, sit back and think 'that's job done'. Developing this type of culture isn't easy. Digital transformations demand that individuals and teams, departments and business units, be aligned and pull in the same direction. It's not about top-down or bottom-up, but more ensuring that the organisation as a whole is cognisant of the need for change and embracing the benefits which will follow.

Then there are the things that everyone wants to do.



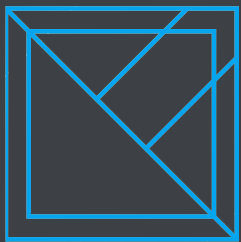
There's gold in them there hills

Everyone knows that with the right insights an organisation can improve efficiency, reduce costs, increase competitiveness, grow market share, and fulfil its mission. But having data is one thing, effectively exploiting its potential is quite another. Sadly, most organisations can relate only too well to the failed programmes, the lost investments, and the rubble of unused platforms which failed to hit the mark. How can organisations find the gold dust, the insights that actually will prove transformational?



Let's move to the cloud

Moving services to the cloud has long been a goal for many, but the recent surge in home-working has increased the focus on cloud services as a way of maintaining continuity and building resilience into business operations. For clients in high trust sectors dealing with sensitive data, there is also the additional complexity of how to seamlessly use the cloud within higher classification environments. It can just sometimes all feel too difficult – so how can clients achieve the agility and resilience that cloud offers, without compromising on security?



Innovate not imitate

New disruptive technologies, tools and analytical techniques are being introduced all the time. Yet not all are useful. How can organisations empower an entrepreneurial, innovative, fresh culture, without just aimlessly following the latest hot new trends? To do this, organisations need to be able to experiment, innovate and combine diverse data with new emergent technologies to establish which can help identify areas of actionable insight that will be worth investing in.



Surf the digital wave

The art of successfully navigating the digital transformation lifecycle requires organisations to proactively manage ongoing digital change: to surf the digital wave and be in control at all times. Organisations need to be able to take advantage of rapid delivery and the adoption of user-centric ways of working, digital services and technologies, at pace and always driven by business and user rather than technological, need. So how do organisations cultivate digital innovation, making sure that the focus is always on the right goal and that teams are moving together, in the right direction?

It's not easy, and it's not always quick – transformation is a journey rather than a destination, but one which can enable organisations to take advantage of new technologies by setting an enduring culture of efficient change, whilst managing the cost and risks associated with their existing infrastructure. **With the right experience, skills and strategic approach, the seemingly impossible can start to look more realistic.**

How we Help

For many organisations, finding answers to all the challenges which arise can seem overwhelming. Partnering with another organisation that specialises in data and digital transformation and has done it all before, many times, and at scale, is often the most advisable route.

The challenges may have evolved, but they are not new, and four decades of working alongside government and commercial organisations have given BAE Systems Applied Intelligence significant expertise in turning ideas into impact, and challenge into opportunity. While we continually evolve to meet the demands of the latest advances in technologies, our approaches are tried, tested and consistent.

We don't jump on the latest bandwagons, we work with our clients to understand their unique environments, challenges and business needs, and then help them deliver changes that transform their ability to deliver on their commitments and aspirations.

As our experience and expertise has grown over decades of client engagements, we have focused our capability across five propositions that address the challenges we see repeatedly crop up.

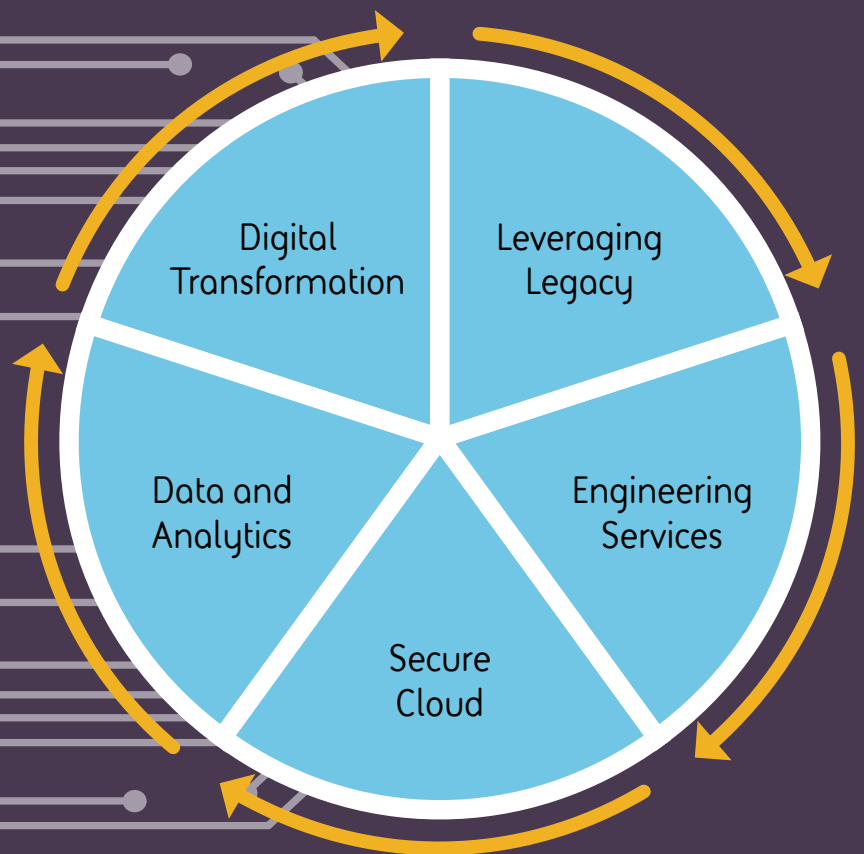


Figure I: The BAE Systems Data and Digital Propositions

Leveraging Legacy

We live in an age where technological change is continuous. Every IT department should have a sign “we are building today the legacy systems of tomorrow”. This will be a constant challenge so organisations need to ensure they know how to maximise the use of legacy platforms to fully realise the benefits of those investments, whilst making the most of new opportunities and technologies.

Legacy systems are often a burden which eat budget, increase cyber security risk, demand increasingly scarce skills, lock away data and stifle innovation. In many cases, these systems will be performing vital business functions, and may well involve critical national infrastructure.

We provide an end-to-end approach to legacy transformation, from definition of the transformation strategy, through to the delivery of new platforms. Underpinning the strategy will be considerations on how to maximise an organisation's ability to benefit from new technologies whilst obtaining value from data stored in legacy systems.

Our proposition provides a proven and pragmatic approach to help organisations address the challenge of legacy systems. Our experience enables us to:

- Provide a clear vision of an open, flexible business and technical architecture. We avoid replacing 'legacy' with systems otherwise destined to become 'more modern legacy' by considering how the architecture can be designed to be updated, enhanced and integrated with new technologies as they are developed.
- Develop treatment plans to address the business processes and practices related to the legacy systems in order to avoid the pitfalls of inadvertently switching off a vital data feed or process.
- Identify data governance, data protection and data quality issues which must be addressed as part of the transformation, including data migration where necessary.
- Consider the many competing demands in a legacy transformation programme. These include: balancing business priorities, evaluating legacy infrastructure and technology, considering available resources and potential investment capacity, and then determining how best to optimise legacy digital infrastructure and integrate newer technologies to enable a digital first vision for your organisation.

Organisations can't simply escape legacy in the short term – however, we can help make sure they get the best out of what they already have and where possible, develop an approach to fixing it and moving forward with an 'evergreen' approach to future technology.

Case Study I:

BAE Systems were appointed by a major UK Financial Institution to choose suitable alternatives for migration of their BI & Analytics capability from expensive and difficult to scale platforms (appliance based) to an elastically scalable and cheaper platform such as Cloud and/or Commodity based. We considered their requirements, made appropriate recommendations and provided a roadmap for migration.

In addition, we helped the client identify Open Source tools (Spark, Python and R) to replace expensive, proprietary tools used for data integration and data processing on Hadoop deployment. To address legal and security issues we defined Open Source tools and vetting processes to mitigate them before use.



Engineering Services

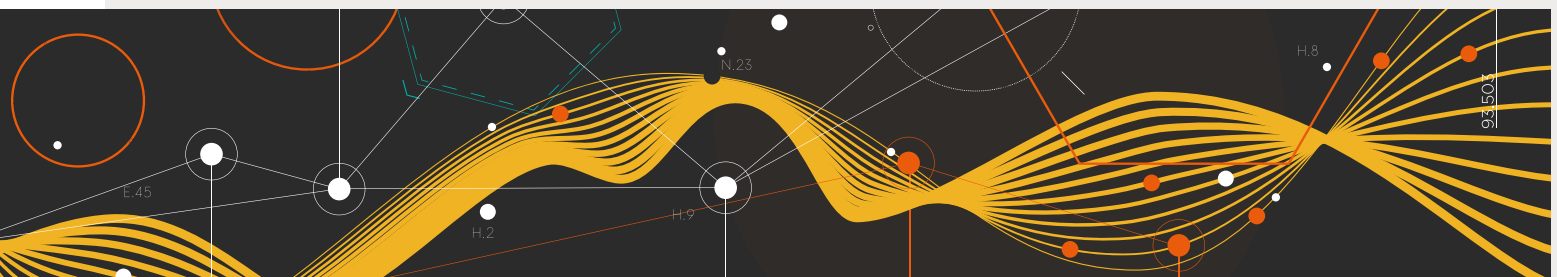
Delivering non-stop, data-intensive operations that create great user journeys requires significant engineering effort, including architecting, developing and deploying reliable systems and pipelines. In some organisations this must be done at significant scale, across multiple territories and, in the case of many national security and government organisations, in classified environments. It is important not to underestimate the scale and complexity of the engineering challenges which may be encountered. Consideration must be given to:

- **The sheer breadth of skills required.** Delivering new or replacement technology solutions which are secure, scalable and resilient enough to underpin critical parts of organisations' operations is no small feat. They need to cover a whole lifecycle of activities encompassing everything from strategy and architecture to data management. This means that experience in current software engineering and operational disciplines, together with user centred design, data science and understanding of legacy technologies, are all prerequisites. Finding resources with the required breadth of skills can prove difficult.
- **The levels of security, risk and operational assurance required to engineer mission-critical systems.** Large scale business critical systems demand a high level of assurance together with deep client knowledge. It is critical to ensure that technology platforms are delivered to users in a way that suits their skills, culture and ways of working.
- **The nature of engineering in high trust sectors.** When delivering into critical national infrastructure or government networks supporting national security operations, any downtime must be minimised or preferably avoided. Organisations must also ensure that development partners have the appropriate security clearances as well as the correct breadth of skills and experience to be trusted to do the work effectively.

Case Study 2

Our client provides marine classification services globally and had been developing a new "mission-critical" solution for assessing and certifying ship seaworthiness. BAE Systems was the third partner to attempt this project with the client and the first to succeed.

We delivered a bespoke, cloud-hosted, enterprise solution to drive business-critical transformation. This was underpinned by a strong iterative engineering process: from case planning, asset modelling and job execution through to report publishing and financing. 1,800 user stories were built in tight partnership with the client. Innovative design enabled us to deliver a solution including web applications that support offline and mobile use: analytics and management information reporting; a sophisticated Task Scheduling Rules Engine, and migration of 12,000 complex assets, 978,000 jobs and 8,000,000 tasks.



We provide engineering services that help our clients plan, build and operate their mission-critical business systems. With a rich heritage in working in high trust sectors over many decades, BAE Systems Applied Intelligence is able to provide the skills, experience, capacity and capability to design, project manage, build and run large scale software engineering and infrastructure projects for high assurance organisations, as well as operate mission-critical systems either on-site or from our own delivery centres.

Case Study 3

Secure government clients have traditionally worked on secure, air-gapped networks, aka the 'high-side'. However, in recent years, they have strategically looked to move capability development and operations to secure public cloud environments, i.e. the 'low-side'.

To actively support this vision, in November 2019, BAE mobilised the Stratocumulus team. The team had the core goal of enabling engineering teams within one of our secure government clients to seamlessly and securely work on their cloud and high-side environments.

An immediate success was creating a low to high code sync tool that created efficiencies in developing capability low-side and deploying it high-side. Latest figures (July 2021) show that there are 240 engineering teams with 1,900 users using the seven Stratocumulus services. These services encapsulate cloud and security best practices and have a major benefit in terms of reducing running costs but, more importantly, have meant that development teams new to the low-side environment do not need to invest in building their own version of the services. Quite simply, Stratocumulus has become key to enabling this government department's engineering community to leverage the cloud.

Secure Cloud Services

Our Secure Cloud Services provide digital support to clients in high trust sectors to enable them to get value from the cloud.

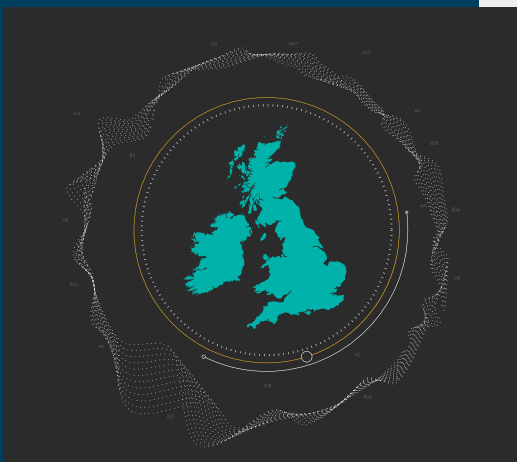
Many organisations in such sectors currently have their technology capability managed in a classified data centre, with their staff working in a classified environment. We enable our clients to move to being a more digital organisation, with their technology capability residing both within the traditional classified data centres, and within on-premises cloud and public cloud environments, with their staff working in both classified and non-classified environments, whether this is physical or virtual.

Our cloud services support organisations in:

- Seamlessly using the cloud to carry out work within Secret or Top Secret environments
- Creating or migrating bespoke capabilities that leverage cloud technologies
- Understanding the cloud security threat.

A key focus of our work is to ensure that all components developed on cloud platforms can be automatically and securely deployed within classified environments. This is achieved by leveraging modern development tooling whilst providing controls that ensure no malicious content or vulnerabilities can infiltrate classified environments.

Our depth of expertise in working in the highest trust environments combined with our consulting-led approach means that BAE Systems Applied Intelligence is ideally placed to help organisations **discover the value they could extract from leveraging cloud technologies.**



Case Study 4

Digitally Transforming Development Lifecycles for the UK DfE Apprenticeships Service

BAE Systems helped build, maintain and secure the cloud platform environments and improve development operations for the UK DfE Apprenticeships Service which provides over £2bn per year in funding to approximately three quarters of a million apprentices.

Data and Analytics

The amount of data created, stored and processed continues to grow exponentially. This presents organisations with the potential to obtain insights that can help them improve their efficiency, manage their risks and exploit new opportunities.

Many organisations struggle to articulate what they want to achieve with data, and its exploitation can prompt legal and ethical challenges. Consequently, data may feel more of a burden than an opportunity.

BAE Systems Applied Intelligence helps our clients understand how data can enable their organisation to achieve their operational and strategic objectives in a legally and ethically compliant manner. We do not immediately suggest using the latest and greatest new products, but instead provide data science expertise to help organisations research and develop trustworthy analytics that derive maximal value from their data. We also help customers integrate analytic capabilities into their processes and tools so that the ability to exploit data - rapidly, and at scale - becomes a core feature of their organisation.

Data, information and intelligence are at the heart of what we deliver. We specialise in helping secure government departments and high trust sectors exploit their data so that analytical insights are embedded into the organisation.

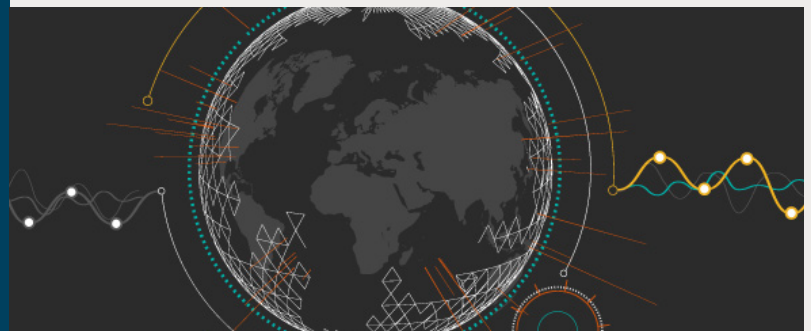
Case Study 5

BAE Systems deployed a brand new risk targeting system for the UK Border Force going from a standing start to live service in under seven months and giving Border Force new capabilities to defend and protect the border.

The initial solution for pre-load air cargo and fast parcel firearms threat detection is live:

- Fuses data from across the Home Office
- Enables new forms of UK border protection through enhanced multi-modal targeting and analytics
- Agile delivery, faster realisation of benefits within 6 months of starting work
- Pioneers use of new technology in a user-centric, scalable solution.

To better protect the UK and facilitate greater trade, this solution is now being further enhanced with a new data analytics capability for real-time risk assessment for all people and freight cross-border events.



Digital Transformation

Today's technology landscape is changing faster than ever before. New and innovative advances become mainstream in a heartbeat and many organisations are struggling to keep up with the pace. The disruptive effects of this new digital revolution are creating insurmountable challenges to those that are not ready.

It has now become essential for organisations to have the ability to easily adopt new technology trends and quickly capitalise on their opportunities. A digitally successful organisation does not simply understand which technologies are available but has the foundations and knowledge to enhance its capabilities, re-engineer processes and enable new ways of operating. This can only be achieved by providing digital leadership, changing the organisation's culture and ways of working to enable a continuous, dynamic digital transformation.

BAE Systems has a track record in helping government departments and organisations embed new ways of working to ensure they are achieving their goals in this digital world. Starting with the vision of the organisation's future, we can develop an organisational blueprint that enables taking best advantage of new and disruptive trends. Our consulting experience, coupled with our ability to identify opportunities that could arise from implementing technological change, means that we can help to cultivate digital innovation with rapid delivery, adoption of client-centric ways of working, digital services and technologies, always driven by business need.

Our successful digital transformation programmes enable organisations to be able to quickly take advantage of any new, disruptive technology by establishing an enduring culture of efficient change. For any organisation to achieve digital transformation, all its parts need to be working in sync with a simple shared vision – this includes enterprise architecture, procurement, strategy, delivery and change management, as well as software teams and suppliers.

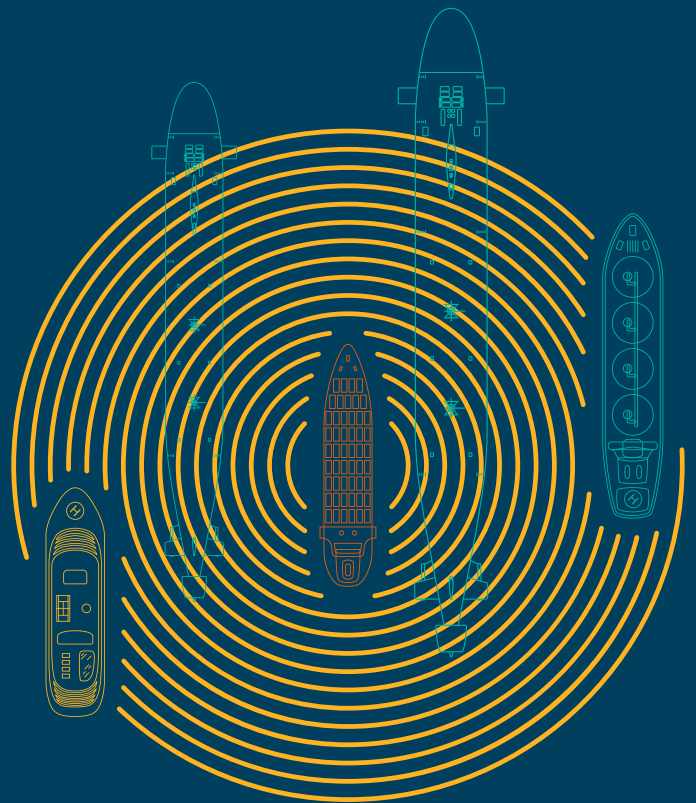
Case Study 6

Driving Cultural Change for a Digitally-agile Royal Navy

The Royal Navy is on a journey to build brand new digital and data capabilities from the ground up to achieve its vision of becoming the most digitally agile maritime strike force in the world. BAE Systems has been helping the Navy create and deliver a coherent digital strategy to support this ambition.

The resulting digital transformation is creating a Navy that is "able as a matter of routine to capitalise on digital opportunities and ready to respond to known and foreseeable digital threats". As part of this transformation we have, for instance, helped establish an executive-level Digital Board to oversee all digital initiatives, foster a cultural change from the top down, adopt new and cutting-edge technology and drive innovation.

This cultural change has been key to support some of the most ambitious programmes such as the development of the Navy Data Platform. This platform, developed in collaboration with BAE Systems Applied Intelligence, is key to the Navy's ability to access data on both warships and on-shore to deploy innovative Artificial Intelligence applications.



Summary

The digital landscape is continuously evolving and this will endure for the foreseeable future. Digital transformation is here to stay. Organisations that wish to benefit from this revolution, and optimise the use of their valuable finite resources, need to engage in and manage a cycle of continuous transformation. Only the careful orchestration of people, processes, technology and culture will get you moving in the right direction.

We are Digital Intelligence

BAE Systems Digital Intelligence is home to 4,800 digital, cyber and intelligence experts. We work collaboratively across 16 countries to collect, connect and understand complex data, so that governments, nation states, armed forces and commercial businesses can unlock digital advantage in the most demanding environments. Launched in 2022, Digital Intelligence is part of BAE Systems, and has a rich heritage in helping to defend nations and businesses around the world from advanced threats.

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