A&D Edge
Digitalization in aerospace and defense

November 2017

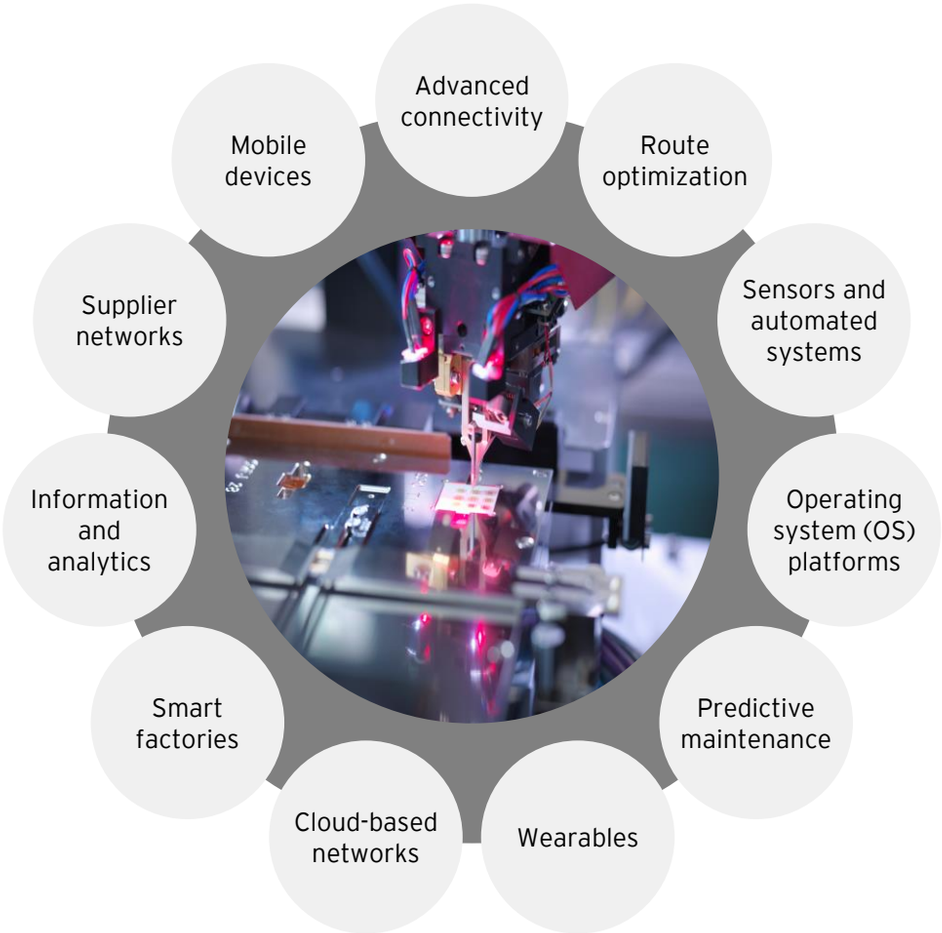
EY
Building a better working world

About this report

Digital is transforming the world. As advanced technologies become cheaper and gain more exposure, new areas are being penetrated where the physical and digital worlds increasingly overlap and blend together. Enterprises embrace these emerging technologies not only to digitize their operations, but also to participate in the flexible and constantly engaging business ecosystem.

Digital leaders understand that to thrive in an age of accelerated change and disruption, organizations need to have both nimbleness and long-term strategy. Rapid development of technology has aided connectivity within different ecosystems, leading to the creation of a connected world in the near future. Continuous connection and interaction with customers and consumers of mobility solutions and services are disrupting ecosystems across a number of industries.

Digital disruptions in the aerospace and defense ecosystem



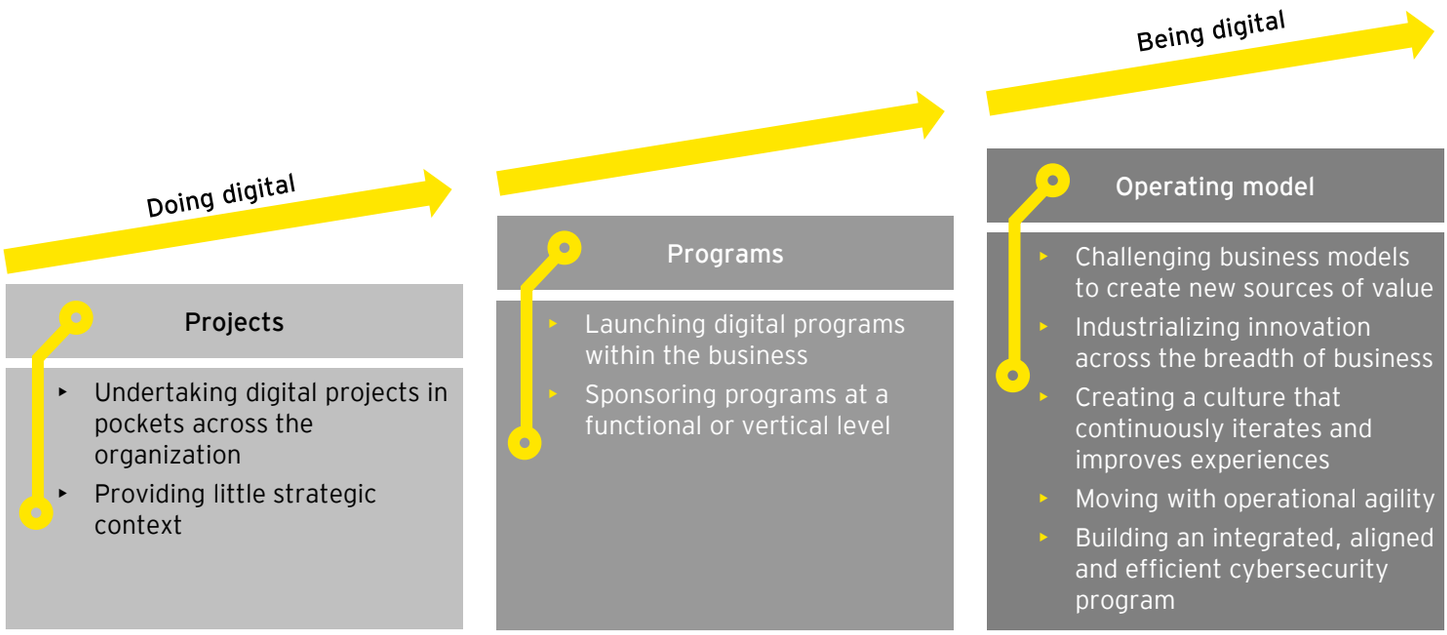
The aerospace and defense (A&D) industry has been among the early adopters of digital technologies. A&D players have been using robotics and automation in their assembly lines since the last two to three decades. However, the evolution of new digital technologies and their adoption have never been at a faster pace than that at which digital is disrupting the A&D ecosystem today. Companies have immense focus on using advanced manufacturing techniques to reduce costs and improve productivity. The enormous amount of data captured through sensors and advanced analytic techniques have opened up a view into insights around operations, product performance and customers that were never explored before.

This report analyzes the major digital technologies that have impacted the A&D industry, and envisions the evolution of the A&D ecosystem in the future.

Why should A&D companies think of digital strategies?

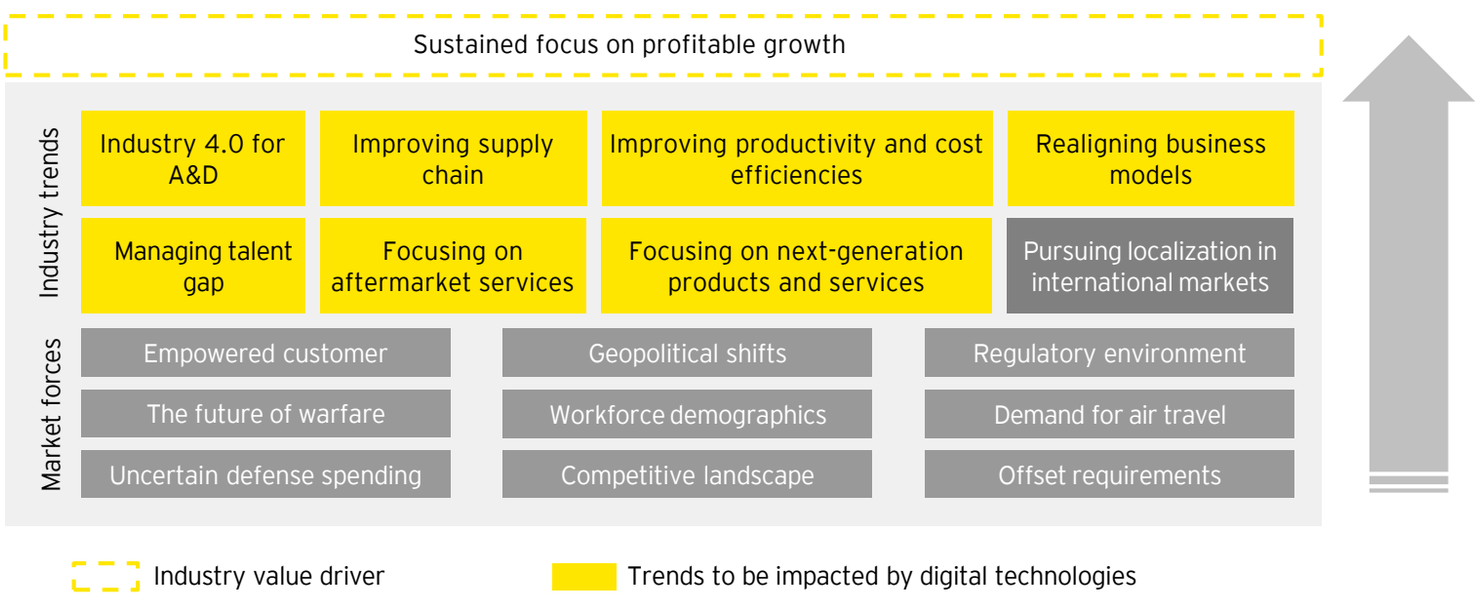
Digital is a continuous form of disruption to existing or new business models, products, services or experiences, enabled by data and technology across an enterprise. It is not about advancement of any one technology or a set of a technologies. Digital impacts organizations end to end. Hence, companies need to see digital from every angle – from strategy to implementation, innovation to operations, while fostering an environment of trust.

Leading companies are evolving from "doing digital" to "being digital"



A&D companies are under constant pressure to maximize profitability and improve operational efficiency. Operating in an uncertain world, they need to continuously adapt to business disruptions. Digital brings in a new level of interconnectivity, which challenges organizations to think differently about risk and resilience while embracing opportunities through driving innovation.

Market forces and industry trends in A&D



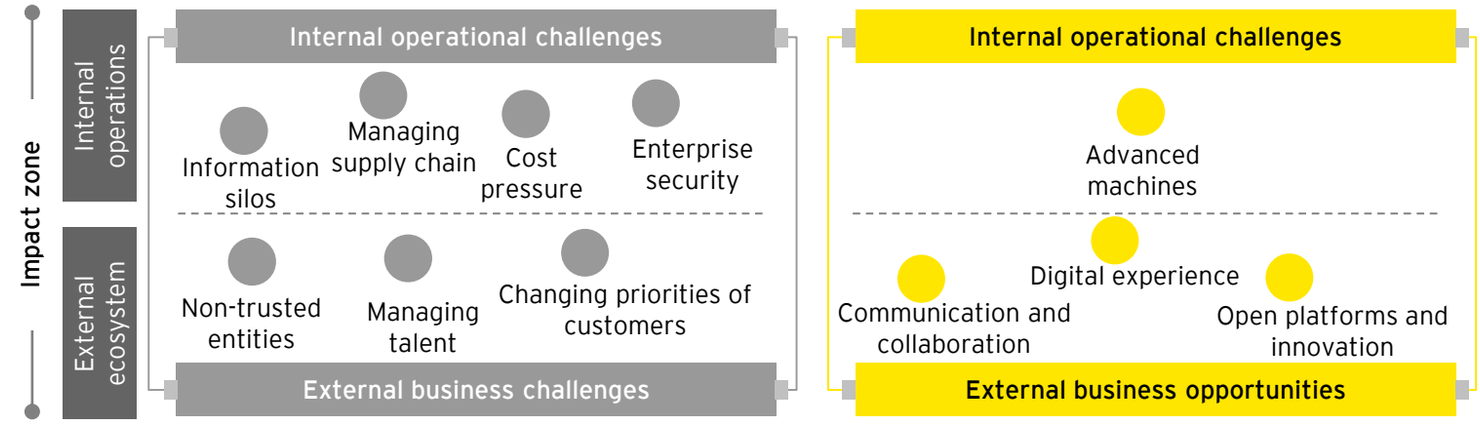
Organizations must evolve at a speed that matches the pace of digital technologies. A&D companies can no longer afford to focus solely on manufacturing and delivering products. They need to be holistic solution providers for their customers with high focus on innovation and agility to quickly adapt to changing preferences. Any company that fails to evolve and take advantage of existing and emerging digital technologies will be left behind.

Business challenges and digital opportunities

The A&D industry presents itself as a complex ecosystem of players – with tiered suppliers, original equipment manufacturers (OEMs), maintenance, repair and overhaul (MRO) service providers, and service providers to governments. Furthermore, the customers, including government defense departments and airliners, are increasingly demanding exceptional experiences at the least possible prices. OEMs and their suppliers are looking for means to cut costs and reduce the "design to product" lead times. To strive in the current era of rapid evolution of disruptive technologies, A&D companies must strengthen their digital capabilities not only to improve operations, but also to look for opportunities to offer new products and services. Being one of the early adopters of digital technologies, the A&D industry looks at revolutionizing the way it operates, overcoming internal and external challenges that pose a threat to the pace and flexibility of the change that digital technologies bring in.

The analysis throws light on the challenges and opportunities across operations and business ecosystems in the A&D industry and the role digital can play in enabling, disrupting and shaping up the ecosystems.

Current business challenges and digital opportunities in the A&D industry



Internal operational challenges

- Information stored in multiple systems result in complex and time consuming processes
- Supply disruptions, high turnaround times and cost overruns affect operations
- Cyber attacks can cause information forgery, destruction or alteration of data

Internal operational opportunities

- OMEs are looking for ways to open up interoperability and derive value from its product data
- Advanced design, machine-to-machine conversations and intelligent data processing enable value-adds
- Advanced connected machines also enhance workplace safety at shop floors

Role of digital technologies

Digital channels for information sharing	Improved efficiency through **robotics, automation, sensors** and **analytics**	**Cyber-protection** and **monitoring systems** to overcome cyber threats	**Connectivity, data analytics** and **open platforms** for innovation	**Open platforms** and **advanced computing** for improved performance predictability

External business challenges

- Legacy systems do not provide mechanisms to validate information or to authenticate products
- A considerable portion of the A&D workforce is expected to retire in the next 10–15 years
- Customers are focusing on next-generation products at affordable prices

External business opportunities

- Open platforms act as plug-and-play systems where participants can collaborate to solve problems
- Enriched user experience and real-time feedback are considered as basic customer requirements
- Seamless communication and collaboration across the ecosystem can help in productivity improvement

Role of digital technologies

Distributed technologies like **blockchain**, and **advance encryption** technologies to ensure trust	**Open source platforms** and social media to co-create solutions	New modes of customer engagement through **mobile applications** and **physical-digital systems**	Seamless communication facilitated by **cloud-based collaboration**

Impact of digital technologies on A&D

The A&D value chain is very dynamic and is going through many structural changes. A digitally connected supply chain provides transparency at every point of the network. Digital technologies, such as internet of things (IoT), big data and analytics, help synchronize demand and supply, procurement, order and inventory information across all value chain partners. Digital innovations such as smart contracts can aid OEMs and government service providers in negotiating complex contracts with suppliers and key customers. On the other hand, aftermarket service operations directly impact customer experience along with raking in good margins. Furthermore, as customers become aware of the advantages of digital technologies, they demand for technologically advanced products and services that help in enhanced user experience and increased reliability.

The table below lists the major digital technologies impacting the A&D ecosystems. It also highlights the impact digital technologies have on solving the internal and external business challenges faced by A&D companies.

Business challenges / Digital technologies	Information silos	Supply chain challenges	Cost pressure	Enterprise security	Non-trusted entities	Managing talent	Changing priorities of customers
3D printing	Low impact	High impact	High impact	Moderate impact	Moderate impact	High impact	High impact
Artificial intelligence	High impact	High impact	Low impact	Moderate impact	Moderate impact	High impact	High impact
Augmented reality	Moderate impact	High impact	Low impact	Low impact	High impact	Moderate impact	High impact
Blockchain	High impact	High impact	Moderate impact	High impact	High impact	Moderate impact	High impact
Cloud, mobile and analytics	High impact	High impact	High impact	High impact	Moderate impact	Moderate impact	High impact
Cybersecurity	High impact	High impact	Low impact	High impact	High impact	Low impact	Low impact
IoT and sensors	High impact	High impact	Moderate impact	Moderate impact	Moderate impact	High impact	High impact
Robotics	Low impact	High impact	High impact	Low impact	Low impact	High impact	Low impact
Robotic process automation (RPA)	Low impact	Low impact	High impact	Low impact	Low impact	High impact	High impact
Social media	High impact	Low impact	Low impact	Moderate impact	Moderate impact	High impact	High impact

High impact | Moderate impact | Low impact | Adoption expected in 1–2 years | Adoption expected in 3–5 years

"Digital is disrupting the fundamental way in which organizations do their business. Connectivity, data analytics, innovation and focus on customer create the backbone for redefining businesses. The new wave of digital technologies provides the greatest opportunity to reinvent operations and deliver breakthrough in performance. Furthermore, digital disruptions enable organizations to accelerate growth by becoming smarter, more customer-centric and more agile."

"We provide confidence to our customers through every digital element of business transformation including tax, legal, people, regulatory, compliance, technology, innovation and capital investment strategy. We look across the entire value chain to ensure that an organization is fit for a digital world, and help them grow and protect their business."

Brian Meadows, Principal, US

Impact of digital technologies on A&D (contd)

3D printing

- OEMs and their suppliers use 3D printing technology to customize aircraft and defense equipment for multiple customers. They deploy large 3D printers to manufacture durable parts from heavy metals such as titanium, and tungsten with minimal wastage. These automated printers offer great precision and low maintenance to OEMs and decrease their supplier pool volume and dependency

A leading aircraft engine manufacturer is using 3D printed fuel nozzles for one of its next-generation engines. As a result, number of parts needed to make the nozzle has come down from 20 to 1. The 3D printing has also helped in reducing the weight by 25% and improving durability by five times.

Artificial intelligence

- Artificial intelligence and machine learning enable suppliers to continuously monitor and analyze large volumes of data related to machines to identify anomalies and predict breakdowns. Creation of "digital twin" – a virtual replica of the machine in the cloud – enables them to optimize operations for various outcomes

- Cognitive insights enable OEMs to improve efficiencies and design better products. Progressively, OEMs use artificial intelligence and machine learning to make autonomous systems, which would be self-sufficient in making flight operational and battlefield decisions on their own

Augmented reality

- Augmented reality and virtual reality technologies are disrupting the MRO business by providing engineers more information about critical parts and visibility to maintenance activities
- Augmented reality technologies can create advanced simulations for pilot and defense personnel to gain significant experience through using virtual A&D systems before even physically handling those

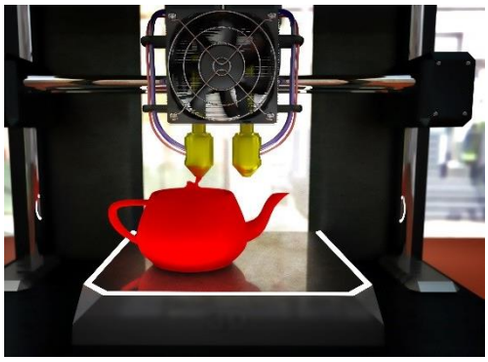
An Australian aerospace company designed a wearable-assisted system that leverages augmented reality to connect on-the-ground technicians with experts anywhere in the world to solve maintenance challenges in real time. The wearable system will reduce repair down time of grounded aircraft as it removes the need for specialists to travel.

EY credential: Augmented reality as shop floor support for an automotive manufacturer

Workers at the shop floor of an automotive manufacturer needed information around design model, instructions and quality control for milling preparation, which was spread over different systems within the manufacturing area. They had to interrupt their activities, change the workplace to get necessary information from a PC terminal, and get back to workplace without any additional check about their preparation.

EY helped in developing a proof of concept of an augmented reality solution to support workers with the right information about their milling process. As part of the solution, the workers could use a tablet with a special augmented reality application that recognizes an order, gives instructions about the needed tooling materials and augments an animation for the different handling steps in a graphical manner.

After implementation of the augmented reality application, the milling preparation workplace became completely paperless and delivered all the needed information in an easy, fast and reliable way to the workers. Through the 3D model augmentation of the instructions, the workers could have a direct visual feedback and the number of mistakes were significantly reduced.



Impact of digital technologies on A&D (contd)

Blockchain

- Blockchain enables OEMs to monitor and collaborate with thousands of suppliers and customers for successful production and delivery of A&D systems
- Service providers for governments can use blockchain to secure their transaction records and protect sensitive information from being mishandled or tampered with

One of the largest defense manufacturers in the world incorporate blockchain technology into its developmental processes, enabling more efficient and assured offerings. The company uses blockchain infrastructure to improve the efficiency and security of its software platforms and supply chain, enhance data integrity, increase speed of problem discovery and mitigation, and reduce risks.

Cloud, mobile and analytics

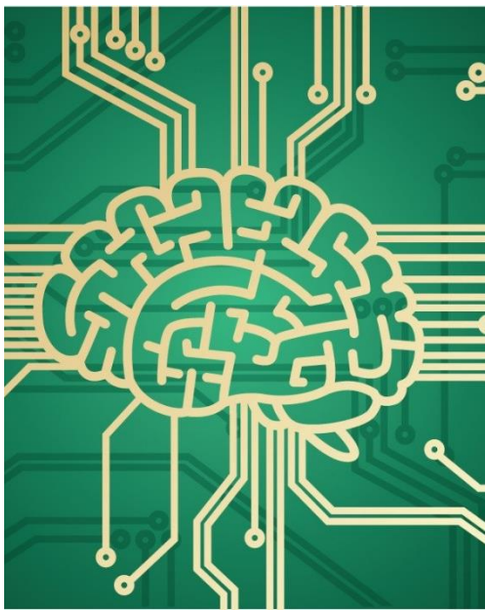
- Cloud, mobile and analytics enable suppliers to act efficiently and connect with OEMs suppliers to optimize the supply chain
- OEMs use data analytics to provide predictive maintenance, track performance and also optimize shop floor processes
- MRO operators use advanced analytics tools to improve work schedule planning and optimize maintenance procedures

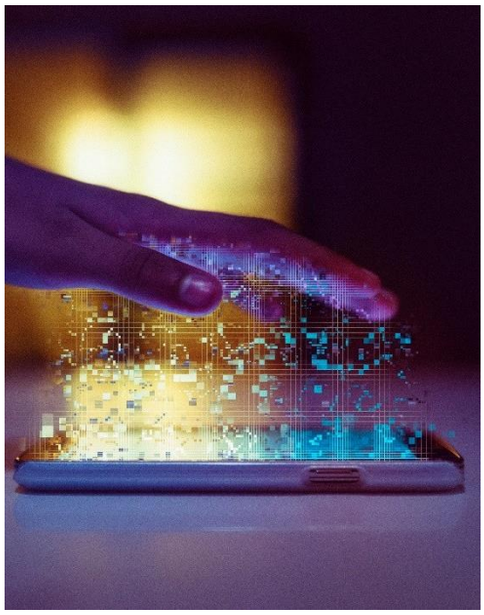
A European aero-engine manufacturer continuously collects information on aircraft engines using cloud and mobile technology. Real time insights generated using data analytics facilitate efficient engine operations and optimize maintenance activities leading to increased aircraft uptime and fuel efficiency.

Cybersecurity

- By adhering to standards and protocols, suppliers can create an infrastructure to prevent leakage of proprietary data and ensure compliance and cybersecurity. A&D OEMs also monitor the cybersecurity capabilities of their suppliers to ensure an environment of trust
- Service providers for governments along with leading OEMs are eyeing opportunities to scale up their cybersecurity capabilities and provide cybersecurity solutions to the governments

A leading US-based defense contractor acquired a US-based cybersecurity firm and the network security business of a leading technology company to form a commercial cyber products business unit. By bringing defense-inspired technology to the commercial sector, the business aims to create a unified software platform that defends against attacks, rapidly detects breaches and stops damage and theft.





Impact of digital technologies on A&D (contd)

EY credential: Developing advanced cyber strategy for an airline

A flag carrier airline recognized their consistent exposure to cyber threats due to their operations across an integrated portfolio as well as ongoing business transformation. They required a pragmatic, risk-based approach to cybersecurity to optimally manage these threats.

EY conducted detailed threat assessments and prepared current and future state cyber risk reports separately for each of the business units of the airline. This also helped the airline to implement governance and operating model changes, focus on the key in-flight technologies, and secure seed funding to establish a cyber transformation program of work.

Developing an advanced cyber strategy helped the airline to market and champion its cyber transformation agenda with key business stakeholders. It also helped the company to build out requirements and go-to-market strategy for a partner to provide advance Security Operations Center capability.

IoT and sensors

- IoT and sensors enable collection and analysis of vast amount of operational data from shop floor assets and critical A&D components. This data is leveraged to track and predict maintenance needs of critical assets and prevent unscheduled maintenance stoppages
- IoT and sensors enable MRO operators to avoid time-consuming disassemblies during inspections and make targeted maintenance decisions. Furthermore, with OEMs eyeing larger share in MRO operations, IoT is enabling them to build intelligence into components and devices used in MRO processes using complex and sensitive flight data

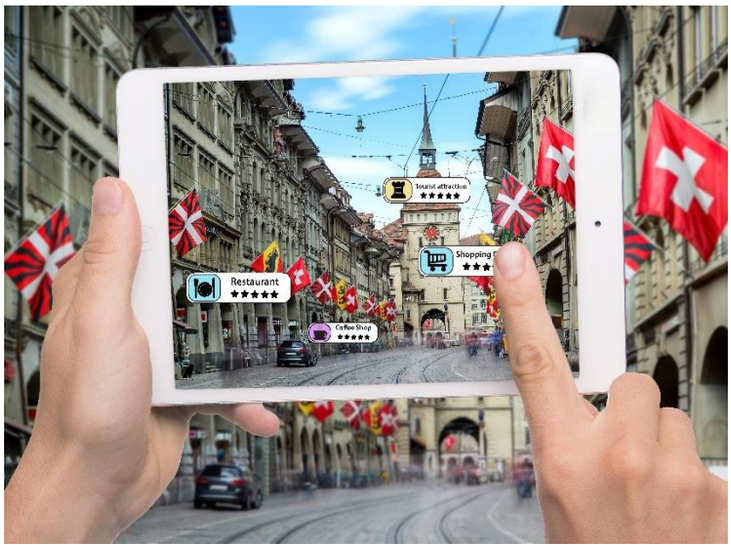
- Distributed intelligence of sensor-connected assets helps production managers make the right decisions on the shop floor. Monitoring and analysis of critical parts can be used to improve machine productivity and reliability

A US-based aircraft engine manufacturer has over 5,000 sensors installed on the aircraft powered by its next-generation engines. These sensors are connected using IoT and generate up to 10 GB of data per second creating an average of 844 TB of data in a 12-hour flight. The engine manufacturers can use this data to predict engine life, improve fuel efficiency, and reduce noise and emissions.

Social media

- Social media platforms are leveraged by OEMs as hubs for brand promotions, news announcements and product-in-action content distribution
- The platforms hold potential to act as a medium for crowdsourcing ideas from end users, to whom the OEMs may not be able to reach otherwise

- Given the talent shortage in the A&D industry, OEMs and major suppliers use social media platforms to attract talent through innovative means such as creating brand awareness, sharing experiences from employees, and even posting some of the job requirements



Impact of digital technologies on A&D (contd)

EY credential: RPA life cycle implementation for industrial products and aerospace system manufacturer

A multinational conglomerate, producing industrial products and aerospace systems, experienced growing pressure for operational effectiveness and enterprise cost reduction due to a competitive market. It wanted to enable time-sensitive events to run without human intervention at a pre-determined schedule.

EY implemented RPA for eight processes including financial planning and analysis, human resources payroll, freight invoice verification, cash application and vendor master maintenance. It also helped the conglomerate set up RPA center of excellence (CoE).

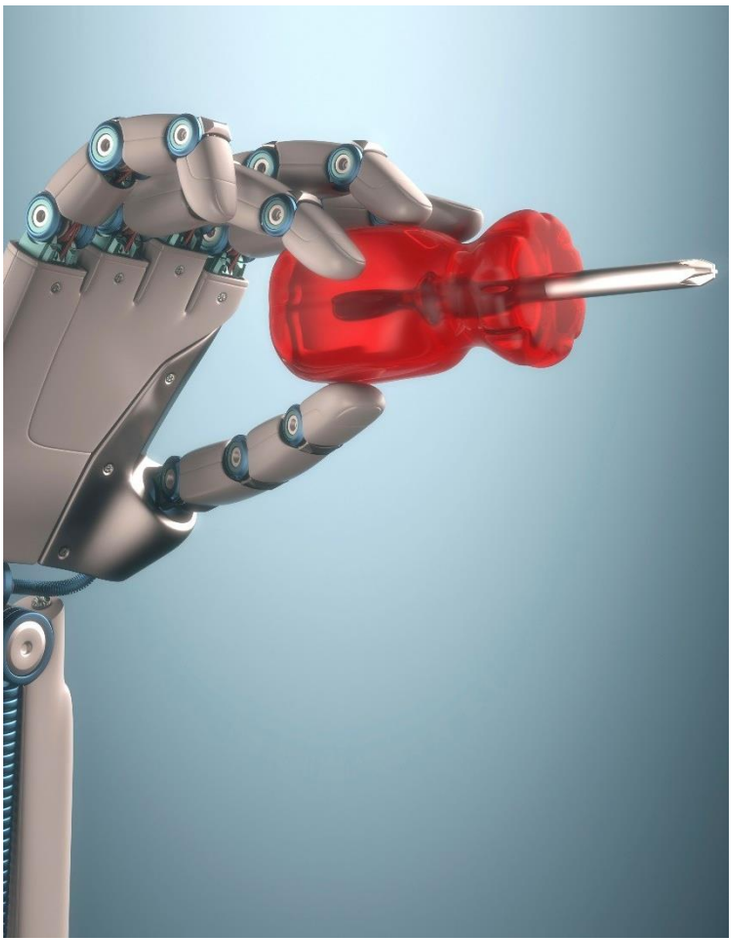
RPA implementation resulted in significant cost reduction, improved quality and reduced turnaround time for critical processes, leading to improvement in service quality and customer satisfaction for the conglomerate.

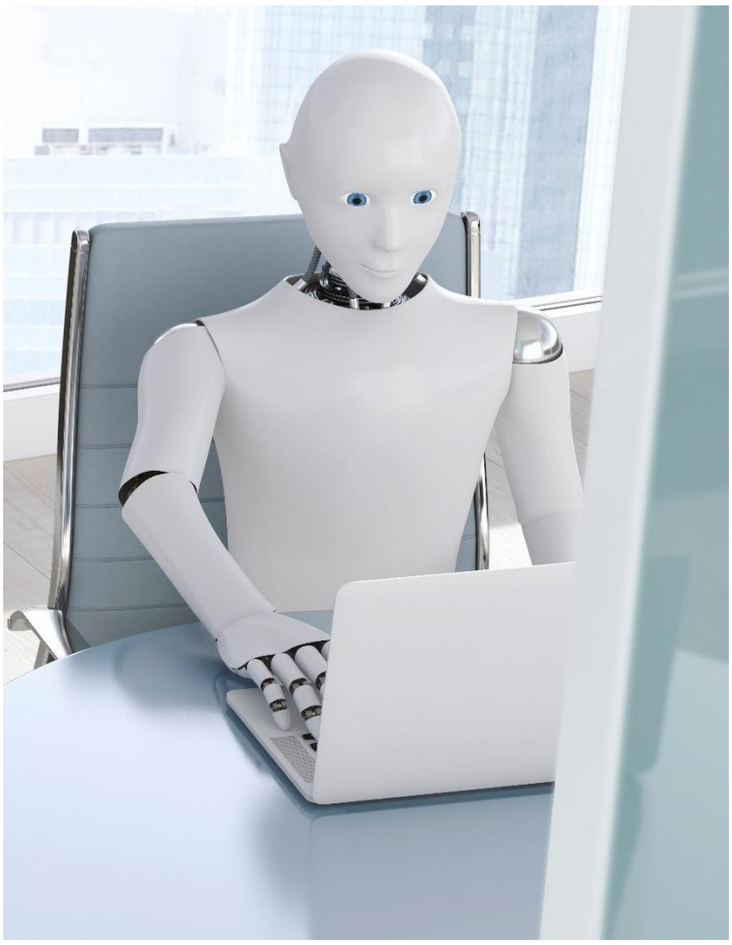
Robotics

- Robots are key components in A&D manufacturing facilities owing to their high degree of precision and high speed in performing repeatable tasks. Key use cases include drilling, fastening, painting and coating applications, and for inspection processes
- Furthermore, robotic surgery techniques hosted on cloud platform enable manufactures of engines, and critical component and parts to provide remote expert support while carrying out maintenance work at any part of the world

RPA

- Using RPA in business processes in finance, human resources and purchasing departments not only leads to cost savings, but also frees up talent to refocus on more value-adding activities



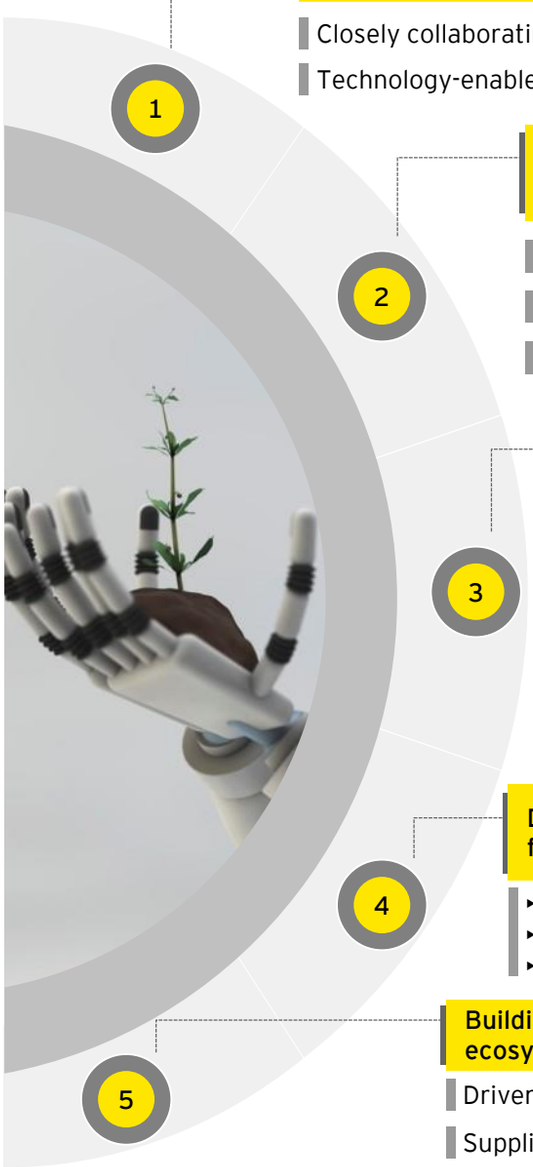


A&D ecosystem of the future

The A&D industry is progressively moving into an era of end-to-end connectivity across the ecosystem leading to safer missions, better operations and enhanced customer experience. As the pace of technology and its adoption is skyrocketing, we can definitely see a change in the technicalities and its resulting outcomes for customers. Digital technologies, such as IoT and connected devices, 3D printing, advanced analytics, blockchain and unmanned vehicles, will likely be adopted by all parts of the A&D value chain in the near future. IoT and connected system will take a central stage in the A&D ecosystem of the future.

The digital transformation of the A&D industry will be triggered by five major industry forces:

1) **Enhancing customer experience and involvement:** A&D companies must ensure that all their business decisions are aligned to the key strategies and changing needs of their key customers.
2) **Redefining products and services:** Product and service portfolios should be aligned to the industry trends.
3) **Digitalizing business operations:** Digitalization must be at the heart of the way A&D companies do business.
4) **Developing workforce of the future:** Companies must develop an agile workforce which is capable enough to adapt the emerging digital technologies.
5) **Building a value chain ecosystem:** The A&D value chain of the future will be an effective collaboration between manufacturers, suppliers and customers.



Enhancing customer experience and involvement

- Closely collaborating with customer in R&D and product development
- Technology-enabled simulation to facilitate better procurement decisions

Redefining products and services

- Offering services with product; focus on long-term service agreements
- Technology driving collaboration and conceptualization
- Providing value-add solutions enabled by data captured through sensors

Digitalizing business operations – not based on cost reduction but customer value

- Omni-channel selling of product and services
- Smart contracts leveraging blockchain
- Cloud-based solutions providing decision support
- Data analytics for demand planning, inventory management, predictive maintenance product quality and customer satisfaction

Developing workforce of the future

- Digital enablement
- Problem-solving
- Driving an innovative culture

- Innovative ways to recruit and retain talent

Building a value chain ecosystem

- Driven by technology and customization, 3D printing will reshape the A&D supply chain
- Suppliers collaborate in product development, planning and service
- New revenue-risk sharing models to incentivize suppliers to bring in product innovation

EY credentials on digital

Designing digital strategies for an industrial conglomerate

The challenge

- A global industrial conglomerate set up a Marketing & Digital (M&D) division to focus on generating revenue in addition to their traditional support activities. In order to support this transition, the M&D division needed to determine success factors for the future and requirements to achieve their desired future state.

What we did

- Assessed M&D's current activities, determined future success factors, determined areas for collaboration, identified revenue-generating opportunities and aligned activities to enterprise strategies
- Gained an understanding of M&D activities and roles and responsibilities through interviews with department heads
- Helped the client to define their strategic imperatives, objectives, key initiatives, governance structure and operating model
- Assessed the current state of M&D and identified strengths and areas for improvement
- Developed M&D's annual strategy and objectives while balancing critical ongoing activities and foundational activities for future success
- Assessed the alignment of M&D objectives with multiple enterprise strategies and recommended adjustments
- Assisted in reconciling the client's annual budget to align to strategic priorities for M&D and the enterprise
- Assessed the current governance structure and process, and provided insights on path forward for improvements
- Developed recommendations on next steps to address the areas needing further attention

Value delivered

- The company learned the industry-leading practices for governance processes and tools and was able to identify the key opportunities and challenges for the M&D division
- The client gained insights on what success looks like in the future. The organization was provided high-level objectives and detailed plans for the M&D division, along with a clean and actionable strategy document to socialize the M&D ecosystem

Master data management (MDM) improvement for an aircraft manufacturer

The challenge

- An aircraft manufacturer's master data (for example, customer, parts, vendor) resided in a diverse set of applications and local databases and spreadsheets, which made it impossible to gain an enterprise view of the data. The company lacked a formal and defined Data Governance program across its global regions, which resulted in master data inconsistencies such as duplicates, inaccuracies, hierarchy differences, obsolete records and incomplete records. The company sought support to better understand their current state and develop MDM improvement program.

What we did

- Performed a current state MDM assessment, followed by supporting the client in co-developing and implementing a future state MDM program that would standardize data across its global regions
- Conducted a comprehensive review and assessment of current state of MDM, data governance and data management capabilities including people, process and technology dimensions
- Built future state design for master data governance processes, master data organizational structures and roles
- Conducted a pilot of the new MDM processes and data definitions
- Developed road map and migration plan from current state to new enterprise definitions and multi-domain implementation approach

Value delivered

- The client could develop and implemented a leading practice-based data management
- The company enhanced visibility into customers and vendors and used that insight to achieve operational efficiencies and improved employee productivity in finance and other business functions
- The organization could follow an actionable, 18-month, phased road map for MDM and data governance by master data domain

EY credentials on digital (contd)

Helping a consumer products company to develop new business models

The challenge

- A global consumer products company was looking to refresh their innovative processes and expand their business model offerings. They also desired an integrated platform to bring together innovative processes from across the company's different service lines and incorporate external feedback and idea generation into their product and business model development.

What we did

- Benchmarked cross-industry incubator and corporate venture capital concepts
- Designed an internal incubator concept that supports the development of new business models together with third parties within a structured approach
- Developed a stage gate process for developing new business models
- Deployed a comparative evaluation model for new business models in the stage gate process (portfolio management)
- Combined B2B product and service portfolios to design a superior value proposition

Value delivered

- The client got a platform to integrate knowledge and ideas across business lines as well as from third parties to expand and diversify solutions and product development
- The company's efficiency in running their knowledge management system, and capability to achieve more creative product development improved significantly through businesses model innovation processes

Helping a diversified manufacturing company to become a data-driven organization

The challenge

- A US-based diversified industrial manufacturer with a large global footprint wanted to bring its three separate business units onto one single digital platform. They wanted program management and leadership support during the high-level design phase of this transformation, with key focus on mobile strategy, single sign on (SSO) strategy and in-memory computing architecture.

What we did

- Assessed mobile strategy, user experience and SSO strategies
- Brought technical knowledge of in-memory computing and mobile capabilities, as well as overarching IT knowledge of cybersecurity and cloud
- Defined the memory computing infrastructure requirements including production and non-production landscape integration (middleware) strategy
- Performed technical configuration of computing architecture to support application life cycle management and end-to-end traceability of requirements through testing, third-party tool discovery and implementation

Value delivered

- The client could define the mobile strategy and get buy-in from both the implementation team and the support organization
- The company could establish an SSO technology in the organization, and was able to develop an SSO strategy that enabled a seamless user experience across multiple platforms

EY's approach to digital transformation

EY's holistic view of digital transformation is supported by a suite of five core offerings.

1 Enterprise strategy

We help our clients rethink their business strategy and operating model for the digital age.

- Do you have confidence in your digital strategy? Are you making the right digital decisions?
- Does your operating model fit purposefully in the digital world? Do you know how to redesign experiences with a humanistic perspective?
- Where is your next big source of growth? What's the value at risk in your business?
- Where's your next competitor coming from and how can you outrun it?

2 Operations

We align, enhance and automate operations and supply chain to deliver on the promise of digital.

- Are you making the most of your data?
- Do you have visibility across your supply chain?
- Are your competitors moving ahead with robotics and augmented reality?
- Does your customer experience meet their expectations?

3 Continuous experience implementation

We analyze the world of the customer first and then design and implement new experiences.

- Do your customers expect a more seamless, intuitive experience?
- How do you transform to a more customer-centric organization? What's the best approach?
- How do you use digital to shift from a technology-centered approach to one that is experience-led? What's the right business case for change?
- Are you getting value from your digital investment?
- Are you concerned about the impact of digital in your industry?

4 Incubation and innovation

We establish an end-to-end innovation capability to incubate new ideas and business models.

- Do you need to do more digital innovation? Are you getting value from your innovation investment? What should your innovation portfolio look like?
- What is the future way to sell your products? How do you transform your IT organization from a cost center to an innovation center?
- Are you managing enterprise and disruptive innovation efficiently? Would your team benefit from a different approach to innovation? How do you become agile?

5 Trust

We scan the digital risk horizon and help our clients build agility to respond to digital risks.

- Is your risk management function transforming along with your organization's digital transformation? Do you have the organizational agility and the right skillsets to respond to digital risks quickly and effectively?
- Do you understand the risks associated with digital technologies and how to manage them? Are you picking the right digital projects? Are you balancing your digital portfolio for the greatest overall investment, risk and reward?
- Are you embedding security and controls in your digital projects? Are you designing your operations to effectively manage risks?

References

"Beware 3-D printing!," *Barron's*,10 March 2014, via Factiva.

"Ipswich business success prompts new office," *The Queensland Times*, 2 May 2017, via Factiva, © APN Newspapers Pty Ltd.

"Engine health management," *Rolls-Royce website*, rolls-royce.com/about/our-technology/enabling-technologies/engine-health-management.aspx#sense, accessed 25 September 2017.

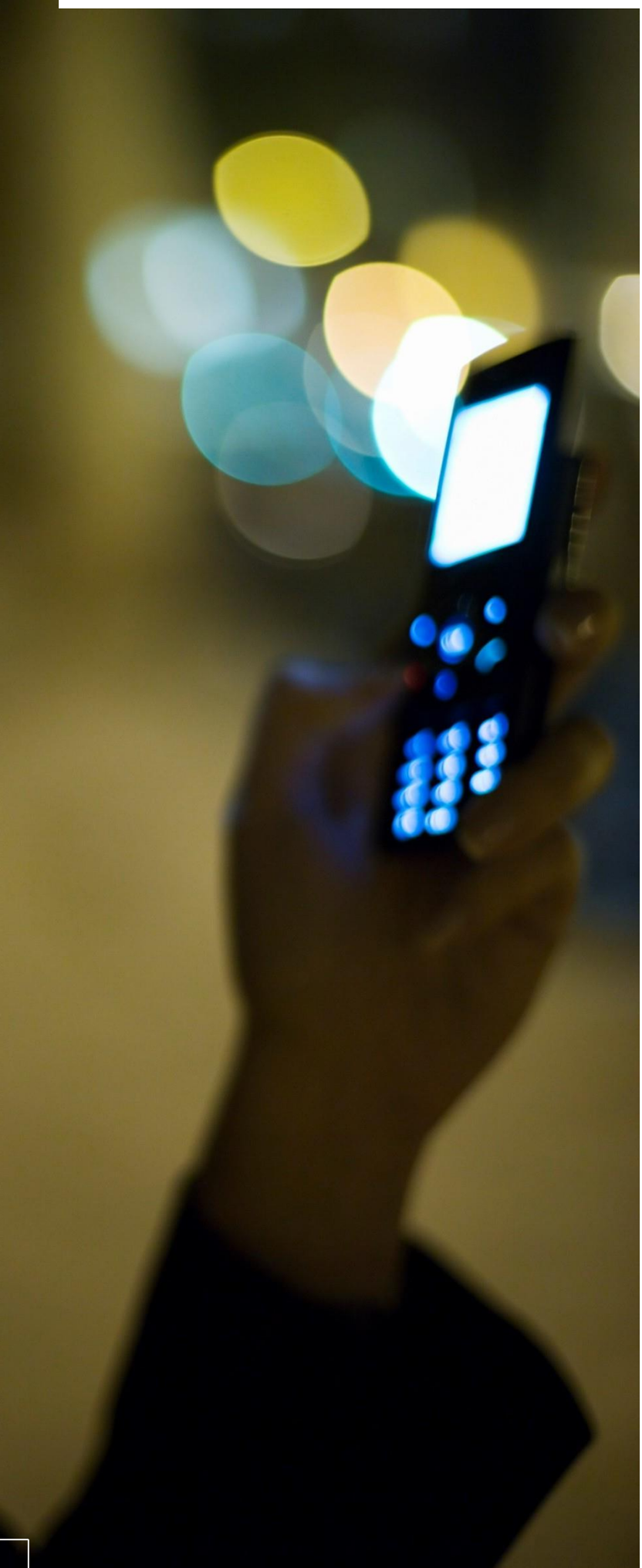
"Airbus and SITA promote proactive cybersecurity," *Watani*, 15 April 2017, via Factiva.

"Why big data and the Internet of Things hold the key to the future of aerospace," *Cyient website*, cyient.com/fileadmin/cyient.com/media/downloads/thought-leadership/150715-TL-big-data-iot-future-of-aerospace-EN.pdf, accessed 25 September 2017.

"Global Cybersecurity Leader Raytheon-Websense Taps DWA As Media Agency for Forcepoint Brand Launch," PR Newswire (US), 25 February 2016, via Factiva.

"Lockheed Martin Contracts Guardtime Federal for Innovative Cyber Technology," *Defense & Aerospace Week*, 10 May 2017, via Factiva.

Key contacts



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