EXECUTIVE SUMMARY

In the aviation sector today, an effective digital strategy is critical for long-term success. The role of digital technology has changed from being a source of marginal efficiency gains to becoming the foundation for transformation, and increasingly companies are recognising the need to innovate - both to stay ahead of legacy competitors and to pre-empt the disruption of established business models by ambitious and nimble digital natives. In this paper we discuss digital transformation in the aviation sector, focusing in particular on the following four themes:

Redesigning Customer Interaction

Digitalisation is transforming the expectations of consumers across the globe. Its pace and scale mean companies need to re-evaluate and transform the customer experience to adapt, using new products, apps and tools to enhance customer interactions.

Business systems and processes

Businesses are re-designing their internal processes, transforming their back-end systems and refreshing their supplier contracting structures to integrate and streamline operations. In addition to creating operating efficiency gains, such changes typically play a crucial role in the achievement of a company’s strategic aims, which increasingly include maintaining business agility for quick adaptation to changes in the marketplace and generating new revenue streams.
Nurturing innovation

Many businesses in the aviation sector are investing in specialised departments or group companies, or engaging in partnering arrangements, in order to ensure that they stay ahead of the curve and are well placed to anticipate upcoming changes. This can range from creating new innovation "labs" and "hubs" which bring together different parts of a business, to partnering with innovative companies and consultants.

Big data and advanced analytics

With the emergence of increasingly sophisticated technology, the ability to capture – and extract value from – ever increasing amounts of data is rising. 'Big Data' can help companies understand customer preferences and buying behaviour to transform relationships. However, as the volume and variety of data increases, so do the challenges associated with the use of Big Data. For many organisations, navigating the complex landscape of data protection, privacy and cyber security laws will be key to unlocking the full power of Big Data, advanced analytics and machine learning.

REDESIGNING CUSTOMER INTERACTION

There is a growing demand for air travel, driven by an expanding middle class in emerging markets, the expectations of millennials, and cheaper airfares. Key to capturing this opportunity will be utilising digital technology to meet consumer expectations. These expectations have, in part, been shaped by experiences in other sectors, such as retail and entertainment, and now increasingly include streamlined and integrated purchasing journeys, frictionless travel and tailored, on-demand services.

The rise of 'the digital consumer' is prominent in the aviation sector, where a significantly greater proportion of customers have an online presence compared with other industries. With the use of digital technology projected to rise dramatically - with estimates ranging from 13 billion to 50 billion connected devices by 2020 - companies are focusing on engaging with customers through effective online purchasing journeys, social listening, feedback apps and links with other players in the aviation, travel and tourism industry.

Airlines, for example, are using customer apps not only to enable online check-in and provide virtual boarding passes, but also as immediate customer feedback channels, and as tools enabling direct communication from the business - including real-time updates on flight delays and to prompt passengers to proceed to the boarding gate. They are now looking to luggage tracking apps, to apps combining airport maps with passenger flight itineraries to assist with tight connections, and beyond. With the increasing accuracy of authentication using biometric data (such as facial recognition and iris and fingerprint scans) trials of virtual airport checkpoints have already commenced and use of iris scans and other such data in the boarding process is also being explored. Similarly, now that onboard WiFi is becoming a reality, some are setting their sights on the next level of tailored service - intelligent aircraft cabins with sensors built into seats to monitor passengers' tiredness, temperature or hydration levels, automatically adapting the cabin environment or prompting crew to take a particular action.
Digital natives, such as online travel aggregators and travel service platforms, are adapting quickly to customer demands, and the increasing prominence of digital platforms is disrupting some traditional value chains. The industry is expecting a greater focus than ever before on owning the customer relationship and establishing arrangements for the sharing of information across business types, as consumer demands for a seamless experience increase and the rise of artificial intelligence and analytics make data more valuable than ever.

At the same time, legislators globally have sought to keep up with changing technology by introducing a range of laws and regulations restricting the use of personal data. For example, the EU General Data Protection Regulation ("GDPR"), which will take effect from 25 May 2018, introduces strict conditions on the use and sharing of data relating to an identifiable individual. Some categories of data in particular receive enhanced protection, including biometric data which will often require the active, informed and explicit consent of the data subject for processing. Given the significant fines available to regulators under the GDPR - up to €20 million or 4% of global annual turnover - businesses across the aviation sector are reviewing and updating their data governance frameworks and policies, as well as their supplier contracts and data sharing arrangements, to ensure that customer and employee data is adequately protected and new data subject rights are supported.

In this heavily regulated industry, data protection laws are of course only one of many types of regulation to be navigated by aviation businesses. Disparities in regulatory regimes resulting in differing local requirements and restrictions can create challenges for businesses seeking to standardise service offerings and customer experiences when operating on a global scale. For example, where airlines fold ancillary services into the customer journey or create package offerings, the degree to which these are caught by specific legislation or constitute regulated activities, and the consequences of this, can vary significantly across jurisdictions.

**BUSINESS SYSTEMS AND PROCESSES**

The aviation sector has long used digital technology to achieve operational efficiency gains and other cost savings. Cutting-edge use of digital technology today ranges from aircraft manufacturers utilising augmented reality in their manufacturing process, to use of robotics for streamlined ground services provision. Airlines continuously strive for ever lighter equipment and entertainment kits to save on fuel costs and a range of businesses increasingly use employee apps for the real-time reporting and quick resolution of issues.

The Internet of Things will undoubtedly enable businesses to break new ground in operational efficiencies and cost savings, as well as revolutionise manufacturing and maintenance processes. For example, while predictive maintenance solutions for engines are not new, the latest engine monitoring systems use aircraft connectivity to examine continuous operational performance data from all phases of flight.

Perhaps the major challenge for businesses in the aviation sector, however, is achieving a "true" digital transformation of back-end systems, internal processes and end-to-end customer interaction models – this means much more than just creating a "digital wrapper" for their existing business models. Many aviation businesses are very large and complex organisations working across various platforms supporting hundreds of different business processes in multiple regions and countries. To adapt to the digital world, many are seeking to consolidate and simplify these processes across their entire business, centralise their technology landscape and update their platforms in order to make efficiency gains and better support strategic aims, such as the transformation of the customer experience.

We are seeing an increasing focus on digital transformation projects in the corporate strategies of companies in the aviation sector, as digital programmes become key in supporting strategic business objectives. For example, aviation clients investing in a USD 700 million cloud-based infrastructure outsourcing and digital transformation programme cited optimising their infrastructure function as a key driver for the project, in order to enhance user experience through better data analytics and reduce overall operating costs. Such projects require careful negotiation - for example, on data protection issues arising in the context of infrastructure-as-a-service; intellectual property issues in the context of contractual obligations to deliver innovation; employee transfer arrangements for affected staff; and vital service levels to safeguard mission critical operations.

We are also seeing a trend towards contracting structures which are designed to capture specialist expertise - such as the use of "tower" contracts that engage different service providers - each at the cutting edge of their field - that have their own areas of responsibility for service delivery. This is typically combined with an agreement as to some level of shared responsibility for the end-to-end service, in order to strike a balance between gaining the benefits of specialist expertise and curbing “buck passing” in the event of service delivery failures.

A key challenge is often the requirement to continue using legacy systems in certain areas. Often large business will use a patchwork of systems of differing ages, and new systems have to integrate with old, until those are replaced. This can hinder digital change, reducing an organisation's ability to transform quickly.

**NURTURING INNOVATION**

Although the capital-intensive nature of the aviation sector can create barriers to entry for many of the types of business in the ecosystem, technological advances are creating roles for new players and strong competition in the industry remains. This is incentivising innovation not only by start-up companies and digital businesses, but...
also by traditional players that are increasingly seeking to invest in departments, group companies or partnerships focused on anticipating and shaping changes in the market.

For example, GE Aviation launched a digital division which combines the operating unit’s digital expertise into one business. In the same vein the Airbus Group has established both a corporate venture capital fund - Airbus Group Ventures - and a technology and business innovation centre in Silicon Valley called A³, which aims to define the future of flight. With a belief that the future is created through episodic disruption and intervening periods of incremental innovation, it proclaims its mission to be building the future of flight by disrupting the Airbus Group and its competitors before someone else does.

Other companies are instead using partnering arrangements to invest in digital and tech savvy start-ups producing innovative solutions relevant to their core business. For example, International Airlines Group (IAG) has partnered with L Marks to launch Hangar 51 - a 10 week incubator programme that enables start-ups and other companies at the forefront of technological exploration to work with IAG senior management to trial their products and services globally with airline customers and pitch for investment. The focus of Hangar 51 is on improving airport processes, digitising business processes, finding new ways to use data for decision making and customer satisfaction, and ‘wildcard’ ideas for improving customer service.

Approaches such as these help aviation companies to keep abreast of digital innovation, continually incorporate new technologies into their business operations and, potentially, anticipate the next “game changer”. The form of investment or partnering selected will have implications for the level of investment required and the level of ownership in the underlying intellectual property. Another key legal issue to consider when structuring partnering arrangements or setting up innovation “hubs” is striking the right balance between accountability, governance and concrete deliverables, on the one hand, and, on the other, facilitating the agile working methods required for innovative development.

Even where investment and collaboration at this level is not being pursued, we are seeing an increased interest in contracts for prototypes and pilot programmes, to test new technologies emerging in the marketplace. Similarly, in business process outsourcings - which are increasingly becoming business process re-engineerings - companies in the aviation sector are continuing to use agile contracts to get the flexibility to incorporate newly developed or newly required functionality later in a project delivery cycle. However, as the fluidity of deliverables in this contract structure can result in reduced supplier accountability, we are beginning to see the rise of a hybrid contracting method - ‘contractualised agile’. This hybrid approach seeks to combine the fluidity of agile contracting with objectively measurable targets over the contract life.

As businesses operating in the aviation sector are subject to industry specific regulations as well as to more general regulations, once an innovation hub, partnering arrangement or contract does yield new products and services, regulatory hurdles may increase time to market. Clearances for the use of new technologies may need to be sought, and regulations across jurisdictions checked.
BIG DATA AND ADVANCED ANALYTICS

With the emergence of increasingly sophisticated technology, the ability to capture - and extract value from - data is rising. 'Big Data' involves using large amounts of data, often including individuals’ "personal data", from a variety of sources, to demonstrate patterns of behaviour and provide insights which can inform the development of products and services. The nature and extent of the data means it can be difficult to process using traditional database and software techniques, but with the value of Big Data ever growing, new technologies such as machine learning or artificial intelligence (AI), that provide effective analysis, are in demand. Machine learning, a method of data analysis specifically designed for Big Data, uses algorithms to learn from data. It looks for patterns to produce reliable decisions, predictions and results on a vast scale.

Machine learning can provide analysis of data as soon as it is recorded. For example, this could include up-to-date information to assist with fraud identification, or could trigger the deployment of additional resources based on patterns of passenger flows across an airport terminal. Big Data and machine learning can also be combined with the use of connected devices in order to collect and analyse vast amounts of data from machines. This can include the use of feedback loops to use the data collected real-time to make adjustments that will drive fuel efficiencies and reduce unplanned engine removals.

Machine learning can also be an effective tool in overcoming internal silos. Organisations often face obstacles when trying to extract value from data, due to the way the data has been stored or the basis on which it has been obtained. Many companies collect large amounts of unchecked data, and consequently do not have adequate oversight of what data is held by, or coming into, their organisations. Data may be held by different entities or departments, and have been obtained subject to different consents or notifications. As a result, although businesses are keen to extract value from the data they hold, they do not know where their most valuable data is stored or on what basis it was collected. Machine learning can be used to break down internal silos by analysing a range of data sources and types and forms on the executable data.

As the volume and variety of data for analysis increases, so do the difficulties and challenges associated with the use of Big Data. Although not all Big Data analysis involves personal data, a large part of Big Data operations often rely on the extensive processing of such data. Where this is the case, businesses will need to comply with applicable data protection laws. In respect of businesses established in the EU (and their processors), or any business who offer goods or services to data subjects in the EU, or who monitor behaviour of a data subject that takes place in the EU, this will include the GDPR.

Under the GDPR, personal data is to be collected for specified, explicit and legitimate purposes, and data collection should be limited to what is necessary in relation to the purposes for which the data is processed. There are restrictions on repurposing data for purposes incompatible with those for which the data was originally collected, which could limit the ability to use personal data in Big Data projects where such use has not been made sufficiently clear to the data subjects or where the
information involved is such that the individual to whom it pertains would have a reasonable expectation that it would not be used in this way. Information notices will be required in order to make clear to data subjects how their personal data is being used and shared. In addition, companies will be required to adopt good information and retention governance, and so will not simply be able to retain data indefinitely for use in future analytics programmes.

At the same time, cybersecurity is a growing risk and an area of heightened regulatory focus. As we are likely to continue to see an increase in legislation in this area in the future, businesses in the aviation sector are advised not only to focus on the immediate cybersecurity compliance obligations, but also to ensure that forward-looking cybersecurity compliance programmes are developed to take into account increasing reliance on technology and data.

This challenging compliance landscape can also be seen as an opportunity for businesses in the aviation sector. Actively seeking solutions to ensure compliance with regulation will allow businesses to not only build on innovative methods to monetise data, but also ensure that the organisation maintains and builds trust with its customer base. Organisations should embrace data privacy compliance as a competitive advantage.

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