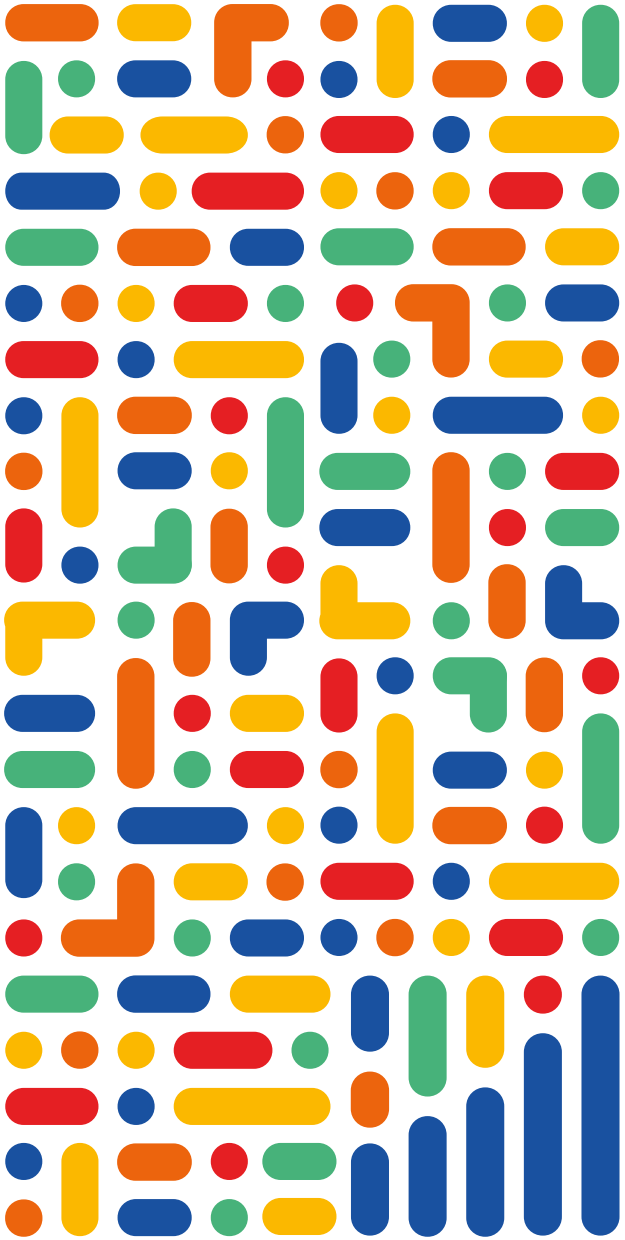


HEXAWARE

Industry Analysis

New aviation technologies:

transformation for the sake of transformation or a real benefit for the industry?

Contents

Introduction

What new technologies will truly make a difference to the customer experience? Hexaware is perfectly positioned to take a view.

The airline industry is entering a significant disruption period by transforming the passenger experience. New technologies are vital to creating an omni-channel experience for increasing the revenue opportunity, cost optimization, improving operational efficiency and enhancing the customer experience.

The ambition for a seamless passenger journey is closer than ever before. But which are the new technologies that can realise this?

As experts offering Airline IT solutions for over two decades, Hexaware is in the perfect position to consider the trends and technologies that can truly make a difference to airline functions.

This Hexaware report covers the emerging, overlooked, and over-hyped technologies that can accelerate digital transformation for customer retention and loyalty while empowering the workforce.

For more information or to download our app for Android or iOS, **VISIT: hexaware.com/industries/travel/**

The aviation technology landscape

The airline industry is becoming increasingly dependent on information technology systems and other cutting-edge innovations. The growing sophistication of the customer experience, preventing cyber attacks, improving operational efficiency, and enhancing the internal stakeholders' experience, all drive the need for modernization.

But the technology landscape of the airline industry is enormously diversified. To analyze it, it needs to be segmented by size into large, medium and small airlines; and by ownership into private, public and government.

The approach toward technology modernization is different from each of these segments.

The large private and public full-service airlines have, over a period of time, developed bespoke software for major functionalities, such as passenger service systems (PSS), cargo management systems, (CMS) and crew management systems. These airlines have been continuously modernizing their software with respect to newer technologies. The modernization activities are more frequently carried out in the user interfaces layer, however, aligning with newer web technologies and mobility solutions. To support the new user interfaces the back-end web services are developed as a veneer over antiquated mainframe technologies. Actual ground-up modernization of complete PSS, CMS or crew management systems is less prevalent.

For under-the-wing systems such as maintenance, repair and overhaul (MRO) baggage handling, and weight and balance – as well as such mainstream areas as flight operations, revenue management, internal communications, business

analytics, loyalty, and customer relationship management – commercial off-the-shelf (COTS) products are often being used rather than bespoke solutions.

Other airline support systems use either bespoke software or are assembled from disparate software using what is known as 'code glue'. These include an airline's public website, intranet website, mobile interfaces, crew management, airport operations (gates, lounges and messaging), in-flight services, petty cash handling, tax calculations, legal reports, ground handling, rosters, catering, uniforms management, IATA clearing interfaces, aircraft engineering interfaces and documents repository.

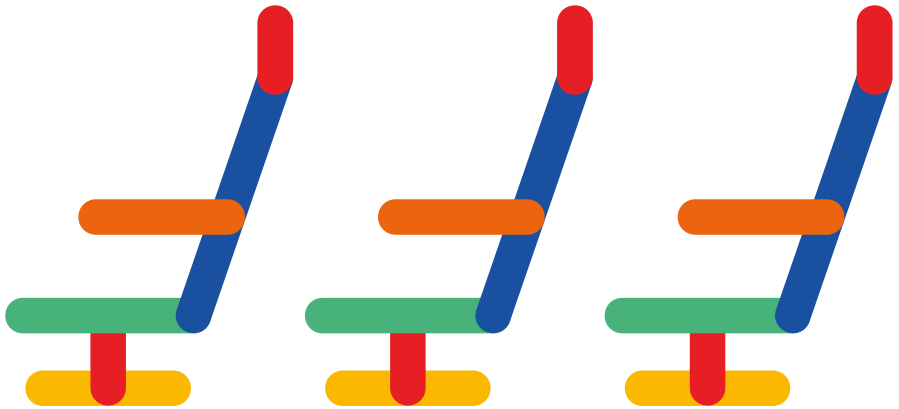
At the other end of the airline industry spectrum, the small private airlines are often budget carriers that thrive by keeping their operating costs low. This is partially achieved by subscribing for Software as a Service (SaaS) from host providers. These airlines are deliberately ultra-agile as they search for competitive advantage, and the SaaS providers keep their systems up-to-date to address this need. There is often use of COTS products for under-the-wing and support systems. Bespoke software is very limited, but might be seen in petty cash handling, financial reports and settlements, catering, uniforms management, and various system interfaces.

Naturally enough, the medium-size airlines are commonly a combination of the above two scenarios. Their PSS and CMS are often hosted on a travel technology provider system and the global distribution system (GDS) companies facilitate their reservations.

For under-the-wing and support systems, a combination of COTS and bespoke systems are used. It is the travel technology provider that drives technology adoption, and, like large airlines, the travel technology provider systems are a combination of antiquated and modern technologies. The in-house antiquated and bespoke systems of these airlines are constantly evolving toward modernization and they are also being replaced with COTS products or SaaS solutions.

In the case of government-funded national carriers, there are many who resist moving away from legacy systems due to a lack of proper funding for technology upgrades. So, the travel technology providers hosting these airlines have to continue supporting the antiquated systems.

The adoption of new technologies in aviation has therefore been a gradual process, and it means many airlines are still maintaining antiquated or bespoke systems.



The world's airlines safely carried

4.3 billion

passengers last year. Cargo airlines also carried nearly

64 million

tonnes of freight, equivalent to

$6.67 trillion

Source: The World Air Transport Statistics 2019

Upgrading legacy systems

Some of the legacy systems used by airlines are considered to be very reliable and so they continue to be used. Nevertheless, carriers are looking for proprietary upgrades for these legacy systems to introduce additional data elements and data views.

Examples include:
- The creation of a facade of web services over legacy systems to perform transactions using modern technology systems and protocols.
- The implementation of the latest passenger identification information, including social media identification, and new government requirements.
- Flight schedule-related views to assess connection times.
- Resource utilization analytics and views.
- New types of tax calculation
- IATA-mandated changes to passenger name records, the electronic ticket, and the electronic miscellaneous document (EMD).
- Changes in communication protocols with government agencies for border and customs management.
- Workflow-based integration with business process management systems.

All airlines require business analytics to facilitate management decisions. The creation of business analytics reports requires the extraction, transfer and loading (ETL) of data from legacy systems to a business analytics software platform. This often necessitates proprietary solutions for data extraction and formatting.

In 2018 low-cost carriers accounted for

31%

of the world's total scheduled airline passengers

Source: International Civil Aviation Organization (ICAO)

Process change

Process change in IATA-regulated airlines was mostly driven by IATA's Simplifying the Business (StB) initiative and its various deadlines, including the change from paper tickets to its the electronic equivalent and the change to electronic miscellaneous documents (EMDs). There have even been changes pertaining to bar-coded boarding passes (BCBP) and home-printed bag tags. Accompanying this was the migration from legacy communication methods such as electronic data interchange to XML-based web services.

But these transformations were implemented by airlines mainly within legacy technologies or by installing communication layers over the legacy technologies. As such, the constraints of paper specification have been carried through to the electronic specification, too. The document length and idiosyncrasies remain the same in both paper and electronic formats, for example. Moreover, there is still a need for paper-based form of identification (FOID) validations to resolve electronic document issues.

Today, smartphones are ubiquitous, making it vital to implement open format data structures in the air transport industry that are easily accessible, transferable, and secure. This will lead to better integration of points of sale, faster movement of data, less network cost, better analytics, and better value propositions from airlines to their customers. Universal methods of passenger and bag identification are required that reference global registries.

In the area of cargo management, the electronic air waybill (e-AWB) has mostly copied the specifications of the paper AWB and many e-cargo processes are imitating teletypewriter (TTY) processes with XML data structures.

With the introduction of smartphones and application program interface (API)-based web services, it is necessary for the CMS to evolve toward cargo data rather than cargo documents. It should be left to the consumer of data to define the data structure boundaries instead of IATA specifying document-based boundaries. This will enable entities to make use of airlines' cargo data according to their needs and additionally allow carriers to better monetize their data offerings.

In the case of budget airlines, hosted by low-cost providers, these systems are mostly data-centric already and use web services API for data communications instead of document-structured interline communications. It leads to agility and efficiency in their operations.

By December 2019, e-AWB penetration had reached

67.5%

Source: IATA e-AWB international monthly report, December 2019

Overlooked technologies

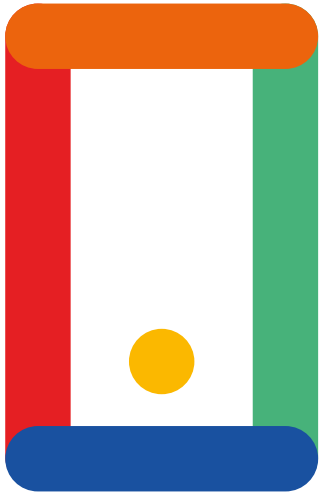
Airlines are still using TTY and EDIFACT-based communications over dedicated networks to ensure message delivery to their partners even though this involves a much higher cost. Since the Internet is ubiquitous and cheap, the message communication technologies developed around Internet protocols need to be used more widely. This would be far less expensive than continuing to use dedicated networks.

Airlines also pay too much to maintain costly in-house sales and marketing platforms. As a provider of transportation services, carriers need to focus on improving their delivery efficiency and making better value propositions for their customers.

Airlines could utilize the omni-present network of aggregator systems and travel marketing companies for the selling and marketing of their products. To enable this integration, airlines need to focus on providing their offers and orders as web services API to these aggregators and travel companies.

Crew, staff, contractor, and customer communications could also leverage open social media platforms. Internal and intra-agency communications should also take advantage of mobile-based communications. Aircraft engineering department communications, aircraft loading instructions, and managing communications during irregular operations could all benefit.

Finally, in the last decade open source technologies have attained greater maturity in a variety of areas, including Java-based application servers, web frameworks, containerization of applications, data warehousing, micro-services, and public cloud-based IT infrastructures. These are available at a much lower cost of ownership and so can be leveraged for cost advantages.



In 2020, there are

3.5bn

smartphone users in the world, 45.12% of the world's population.

Source: Statista 2020

Emerging technologies

Vision-based identification, round-the-clock bots and AI could all play a role in the digital transformation of the airline industry.

The following technologies might be useful for airlines:

- Vision-based customer identification for faster boarding at airports.
- Vision or radio frequency-based baggage identification and tracing.
- Mobile network-based customer/goods location and navigation guidance.
- Pervasive help functions delivered through round the clock available bots using natural language processing (NLP), artificial intelligence and machine learning.
- Rich communication services over mobile platforms for anytime transactions.
- Micro-services for the high scalability of applications.
- Augmented and virtual reality (AR/VR) based platforms for staff training and the marketing of products to customers.
- Public cloud platforms for IT infrastructure.
- Machine learning for building better offers for passengers.
- Machine learning for managing the irregular operations of airlines.
- The Internet of Things (IoT) for the real-time tracking of assets.
- Drone and vision technologies for the assessment of infrastructure and assets.

>80%

of organizations expect to compete mainly based on CX (customer experience).

Source: Gartner, 2019

Blockchain

Blockchain is *the* buzzword in discussions about aviation technology. Basically, it is a method of data management and communication. Unlike centralized systems with centralized ledgers that are accessed by its users, blockchain is a distributed ledger where every user of blockchain has a ledger for storing a chain of data blocks in chronological order.

The blockchain system facilitates the secure and reliable transfer of data across the network of nodes by using a very efficient protocol. The blocks in blockchain maintain a cryptographic hash of transactions data and the hashes of previous blocks.

The hashes are created using computationally intensive processes called blockchain mining. This makes it impossible for any individual user of the network to manipulate the chain.

In turn that enables reliability, scalability and decentralized high availability of data for all users.

The introduction of a new block by any user has to be accepted by the majority of the users of the network. The consensus rules are inbuilt in the blockchain system. Since a block only contains hashes of the transaction data, its size is minimal. The actual transaction data is maintained separately as an inverted tree structure and the root of the tree is referenced by a block for traceability. The transfer of transaction data among the nodes happens on demand.

Today, large airlines or system hosting providers mainly use centralized systems that are accessed by all stakeholders for performing various transactions. Therefore, there is a tremendous load on the centralized system, which must maintain availability and scalability at all times.

Worldwide spending on blockchain solutions is expected to grow from **1.5 billion** *in 2018 to an estimated* **11.7 billion** *by 2022.*

Source: Statista 2019

Blockchain was invented by a person (or group of people) using the name Satoshi Nakamoto in 2008 to serve as the public transaction ledger of the cryptocurrency bitcoin. The identity of Satoshi Nakamoto is unknown.

There are several scenarios that would make blockchain a viable alternative. For example, airlines maintain the data containing the features, price and availability for their seats and services. Agency networks get the data from carriers either through an authenticated periodic feed of data by distribution providers or by the real-time querying of data direct from airlines.

Either method of pushing data is costly for airlines. By using a blockchain network, airlines can substantially reduce the cost of data transfer. The agencies present on the airline blockchain network would get regular authenticated data feeds without requiring third-party services.

Blockchain can also be used for the transfer of a sales record and subsequent orders for travel and services to the agency, and traveler and partner systems, eliminating the need for paper and costly network subscriptions.

Blockchain can also be used by:

- Service providers to accept the loyalty points accrued from airlines as form of payment.
- Travelers taking advantage of airline-provided electronic wallets so that loyalty points can be used for purchases on approved sales platforms.
- Asset management to maintain such items as aircraft leases records and much more.
- MRO companies to pay for spare parts and notify suppliers about requirements.
- Airlines to exchange regulatory information with governments, such as legal filings.

Implementing the Internet of Things (IOT) on aircraft and other asset monitoring programs can also benefit from blockchain. Measurements can be made in real time using IOT sensors, which would allow the smart contracts established between the user and the supplier to be changed accordingly. Smart contracts can evolve instantly, generating efficiencies for both parties.

Over-hyped technologies

Blockchain, like any new technology, is going through the usual hype cycle. It will likely become an established technology as its capabilities are well documented. But, of course, many other products are abandoned despite the initial hype.

In aviation, there is considerable hype for voice transactions through various voice-enabled devices. For a data query, this channel of interaction may be useful, but for carrying out financial transactions it looks over-hyped due to lengthy conversational cycles and imitation threats.

The use of cryptocurrencies such as bitcoin has been hyped for some time. But using cryptocurrencies for airline payments again looks over-hyped considering the lack of support from governments and financial institutions. It may be, though, that blockchain can be utilized for bitcoin to have some degree of impact.

Augmented reality and virtual reality were touted as ideal technologies for operational efficiency, but a lack of versatility means – for now – these are mostly being used for staff training, virtual product marketing, and tourist guidance.

Finally, vision-based human recognition systems, though useful for fast travel, is being resisted by many governments due to various biometric data control regulations. Airlines will probably not be able to consolidate their operations by implementing vision-based systems any time soon. Biometric-supported boarding will only be a complementary system alongside standard boarding procedures for the foreseeable future.

Measuring the success of new technologies

After considering all these factors, decisions about new technologies will be a little easier. But the final element to consider is measuring the success of an initiative. It is necessary to compare the old and new systems in terms of value realized. The increase in revenue and cost savings for calculating the return on investment are readily available measurements. Besides these, the increase in customer engagement, brand loyalty, and efficiency gains can also be measured. A variety of business analytics reports based on sales data, resource utilization, and incidents data provide important insights from these measurements.

As an example, the introduction of a mobile-based sales channel does indeed lead to an increase in customer engagement and satisfaction. But it is the comparison between incremental sales data and the maintenance cost of the mobile channel that gives proper insight into the value derived by the airline.

As a software services company, Hexaware's success is aligned with the success of airlines. Expanding our footprint into new areas of airline operations, winning new or renewing development, and support and maintenance contracts are all measured.

Besides this, employee satisfaction, training, marketing and sales costs, technology durability, and traction are all monitored in a transparent manner.

181 million

the number of years it would take someone to download all the data from the Internet today.

Source: www.physics.org

Conclusion

The real benefits to the industry will come from those technologies that prove their capability and demonstrate results.

Supplier trust is measured in terms of capability, result, and value proposition. Industry certifications, awards, ratings, branding, and customer relationships are used to judge capability. Success stories regarding the implementation of new technologies boost the results-based trust. And the adaptability and contextualization of the value proposition in respect of the airline's needs and financial potential finally results in a mutually beneficial contract.