Data sharing opportunities and challenges in the aviation sector

Summary of DfT-ODI workshop 17 October 2018

Introduction

In 2017, the Department for Transport (DfT) released a call for proposals for their upcoming Aviation Strategy for the UK aviation sector titled "Beyond the horizon: the future of aviation in the UK". The outcome of this was the creation of a 'next steps' document outlining how to proceed. This involved identifying six key areas of focus in the long term Aviation Strategy including:

- Help the aviation industry work for its customers
- Ensure a safe and secure way to travel
- Build a global and connected Britain
- Encourage competitive markets
- Support growth while tackling environmental impacts
- Develop innovation, technology and skills [1]

The strategy aims to take a customer-centric focus and commit to delivering benefits to people and businesses that use their services. DfT is keen that data is at the heart of this strategy.

DfT asked the Open Data Institute (ODI) to run a workshop that brought together key stakeholders across the aviation sector to understand the challenges that their organisations face, and to discuss how sharing data can create solutions to overcome those challenges.

This report briefly summarises the key aspects covered in the October workshop.

Workshop format and attendance

The DfT and the ODI invited a subset of stakeholders from the aviation consumers side to discuss what an open aviation sector would look like. The ODI ran the workshop at their London HQ to facilitate discussions on the benefits of data sharing, key data infrastructure, stakeholders, outcomes and challenges. Upon completion, the group had developed a better idea of what the strategy meant for their organisations and role, and the impact that opening and sharing data would have on their ability to improve passenger experience.

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[1] Beyond the Horizon: The Future of Aviation in the UK. https://aviationstrategy.campaign.gov.uk/

Main focus of the discussion

The main theme to emerge from the workshop involved the potential for data sharing to improve the consumer journey, primarily through a reduction in the impact of disruption (including flight delays and cancellations). This aligns with the findings of the Aviation Strategy next steps document 'Beyond the Horizon: The Future of Aviation in the UK' which focussed similarly on passenger disruptions and the mitigations of their effects, which said that 89% of travellers only found out about delays and 81% of people learned about cancellations when they arrived at the airport.

Workshop delegates identified the main benefits of more data sharing in the aviation industry involved tackling disruption to the consumer journey (two of the four answers were explicitly about disruption). One group imagined that airlines would have fewer delays due to more information being accessible throughout the entire aviation sector. The other group saw the main benefit as better informed passengers during disruptions and providing consumers with specific options tailored to their unique travel situation to minimise any potential impacts of disruption and ensure a seamless journey.

Opportunities for innovation

How could more data sharing benefit the aviation sector?

The main theme suggested around key benefits involved the provision of better options to ensure better informed passengers and minimising any potential impact of disruptions on the consumer journey. A lengthy discussion focused on what those specific benefits might look like. Participants discussed data sharing from border control and ground handling teams that would help more accurately provide passenger arrival time. Data sharing across industries, including taxi and train organisations was also discussed to help create seamless passenger journeys beyond the airlines and airports themselves. The full list of ideas of benefits is listed below.

The groups came up with the following key benefits:
- Customers better informed and airlines have fewer delays
- Improved operations using live data
- Efficient use of infrastructure (slots, gates, passenger journeys)
- Passengers are better informed regarding journey choices during disruption, and their options are tailored to their needs to ensure a seamless journey

In addition to the agreed main benefits, participants suggested numerous other benefits that would potentially result from increased data sharing:
- One version of the "truth"
- Companies can benchmark
- Better communications between airlines and airports
- More efficient use of capacity
- Third party solution development
- Clear data for passengers

- Innovation for start ups
- Standardising opportunities for customers
- Research and development benefits
- Identification (passports etc.) is more efficient and more secure
- Improved efficiency
- Greater collaboration
- Seamless travel opportunities
- Better informed businesses and government
- Improved journeys for passengers with reduced mobility (PRMs)

What data is key infrastructure?

The second exercise involved participants discussing what datasets were key infrastructure both in their sector now and in the future.

The groups suggested the following key datasets:
- Disruption data including the status of ongoing disruptions and reasons for disruptions
- Airspace data including schedule data by geographic area, airspace restriction data and its impact on journeys
- Location / position data of airplanes and environmental impact data (noise, emissions etc.)
- Arrival data; such as scheduled and actual status, borders data and ground handling (eg. Home Office have border information that DfT does not already have)

The discussions on data infrastructure yielded many ideas of what data when opened up or shared more widely would improve passenger experience. Outside the top four datasets, participants discussed the following:
- Surface transport (road/car, train, bike etc.)
- Flight (schedule, estimates, actuals, typical times)
- Aircraft type
- Seat capacity
- Seat occupancy
- Passenger flight
- Passenger connecting flight
- Passport
- Passenger baggage, ground handling
- Queues (border, security etc.)
- Delays (occurrence, time, reason)
- PRM specific data
- Airport data (maps, information points, transfer data (Wayfinder, walk times), baggage claim, etc.)
- Accommodation
- Prices
- Passenger ID
- Passenger / freight volume

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Who are the key stakeholders and are they engaged?

Workshop participants were asked to identify key stakeholders for the sector and strategy, and among the key stakeholders, discuss how engaged they are with industry and its changes more broadly.

The groups suggested the following key stakeholders and their level of engagement:
- Engaged
  - Airports and the Civil Aviation Authority
  - Passengers are the most critical stakeholders with a wide spectrum of engagement
  - Airlines and airports are most engaged
  - Industry Resilience Group (IRG)
  - All stakeholders are critical with varying engagement

- Not engaged
  - All stakeholders are critical with varying engagement
  - Home Office
  - Passengers
  - Airport services

Though their level of engagement was not publicised to the wider group, the workshop participants suggested a number of public and private sector organisation stakeholders that are important to the sector generally and from a data perspective, including:

- Government (DfT, local governments, Border Force, Met Office etc.)
- Technological companies
- Travel agents
- Taxis and local automotive services
- Air traffic control / IATA
- Security staff / organisations
- Air navigation service providers (ANSPs)
- Train organisations
- Ground handlers
- Freight firms
- Local business / retailers
- International Civil Aviation Organization (ICAO)
- Highways England
- National Air Traffic Services (NATS)
- Regulators

What does success look like?

The final activity of the first session involved describing what a successful aviation strategy would look like. This was predominantly a desire to improve the overall door-to-door passenger experience. The descriptions of how to improve passenger experience took on

different tones, indicating there are numerous sub-outcomes to success that have different priorities to different stakeholders.

The groups suggested the following key outcomes:
- There are two stages involving making all operations data available for new companies to work on and enable solutions to emerge and to increase passenger satisfaction. Sub-objectives include business benefits based on more shared data such as recommendations and decision making.
- The overall passenger experience, recapturing the childlike excitement of travelling, including seamless journey information that begins when you leave your front door and disruption response and prevention.
- Disruption reduction to ensure that service providers have all the information required to help inform consumers in a better way. Controversially, if centralisation is more efficient then maybe data should be sent to fewer places.
- "One version of the truth", interoperability to ensure the seamless customer journey, and information being pushed out to customers so that they receive this more easily.

During the brainstorming discussion, several ideas also came about that, although related to improved passenger experience can be seen as sub-outcomes or stage-goals to the ultimate outcome.

- One supply chain path
- No added burden to any part of the consumer journey
- Single platform for data / information
- Well informed passengers
- Real time data
- Less anxiety when travelling
- Full transparency
- Equipment and infrastructure optimisation
- Well staffed immigration / border / security control points
- Data (needed to be) sent to fewer places
- More aviation start ups and SMEs
- Less congestion / pollution
- Efficient regulatory information finding
- Passengers can rate airlines and airports more easily and the industry uses this information to subsequently improve services

Challenges to implementation

The second session of the day was devoted to identifying the challenges to building a data informed aviation sector and understanding their associated complexity. To help understand and communicate the concept of complexity regarding these challenges, we employed the Stacey Matrix,[2] a visual tool that maps challenges out depending on their perceived certainty and agreement. Certainty refers to "the degree of certainty and predictability about what results will be generated from the solutions proposed for addressing the challenge". Agreement refers to "the degree of agreement among the participants regarding the challenge and the best way to address it."[3]

The exercise yielded over 100 challenges, albeit many either similar or identical, spanning issues around security, privacy, process, skills, technology, regulation, trust and commercial considerations. The most common concerns, though sometimes without the same perception of complexity were around:

- Data standards - 7 responses
- Commercial and competition concerns - 7 responses
- Data quality - 5 responses
- Data protection and GDPR - 5 responses
- Security challenges - 4 responses
- Identifying the right data - 4 responses
- Data ownership challenges - 3 responses
- Cost challenges - 3 responses
- Management and leadership challenges - 3 responses

Using this information, we see a clear concern amongst workshop participants around both technical and regulatory challenges. There is a high perception that data standards are the most significant technical barrier to building a data informed aviation sector followed by data quality. On the regulatory side, commercial and competition concerns are the most significant perceived barriers, followed by data protection legislation such as the General Data Protection Regulation (GDPR).

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[2] The Stacey Matrix. http://www.gp-training.net/training/communication_skills/consultation/equipoise/complexity/stacey.htm.
[3] Ibid.

Categorising the [total list of challenges](#), the challenges can be broken down by complexity categories:

Challenge Category	Frequency	Main Perceived Complexity
Regulation	21	Complex
Process	17	Complicated
Standards	15	Complex
Technology	11	Complicated
Commercial	9	Complex
Trust	9	Complex
Finance	7	Complicated
Customer	5	Complicated
Security	5	Complicated / Complex
Skills	5	Complex

Regulation and process oriented challenges were considered priorities, indicating a general concern around necessary actions and rules for successful change in the aviation sector. These primarily fall in the complexity range of complex and complicated, which will require a variety of stakeholders and expertise to overcome if true.

Categorising the complexity of challenges by category indicates the following distributions:

Perceived Complexity	Frequency	Main Challenge Category
Simple	12	Process
Complicated	28	Process
Complex	53	Regulation
Chaotic	11	Regulation

The distribution of complexity was significantly skewed towards the complex region of the Stacey Curve, with over half falling within that range. Complex problems are described as not having a well-defined methodology to attain success, and requiring more experimentation than expertise to solve.

Generally speaking, more process, skill, and technology oriented challenges tended to cluster towards the simple-complicated portion of the matrix. This could be due to the fact that these types of challenges have been tackled in some way previously through training, innovation and collaboration. Issues concerning regulation, privacy, trust, and commercial concerns tended to cluster towards the complex-chaotic portion of the matrix. This was a possible outcome of the existing uncertainty around privacy and security issues and the

difficulties in solving challenges around commercial and trust-based concerns, involving several stakeholders with numerous differing desired outcomes.

Simple Challenges

Only 12 challenges emerged within the simple range of the Stacey Matrix. The majority of these challenges involved processes. Standards and technology also received more than one idea.

The workshop yielded process challenges such as identifying the right data, using data more effectively and publishing additional data. Overall, this could be classified as doing better with what already exists, and is a typical theme of simple challenges.

Other challenges came around the implementation of data standards, and standardising methodologies for sharing and using data. Innovating with existing technology and overcoming issues related to legacy technology also formed a part of the simple challenge analysis. Interestingly, there were some less commonly seen ideas such as data security, and increased use of start-up organisations.

Complicated Challenges

A number of different themes emerged across challenges deemed as complicated. Several complicated challenges fell into relatively manageable categories such as process-oriented, technological and financial issues.

Some of the process challenges suggested as simple also sprang up as complicated, including generating new data, identifying data gaps, and deciding which data will be useful to drive behaviour. Exclusively complicated process challenges centred more on management aspects of the data ecosystem. Another important challenge included deciding where the responsibilities for leadership and management are perceived to be challenging but accomplishable aspects to implementing the strategy, and would likely fall into the "political decision making" area of the Stacey Matrix.

Financial challenges included implementation costs of increasing data sharing across various organisations, underwriting the liabilities that might be associated with any adverse effects from implementation, and financially incentivising stakeholders. Any open strategy must of course have proper safeguards to insure against harm and abuse.

Challenges also arose concerning the technological aspects of the strategy, ranging from standards and technology to the skills required for success. Data standards and interoperability, much like in the simple case, were also seen as potentially complicated issues.

Issues covering data sharing speed and Internet of Things (IoT) sensor data also arose, particularly concerning challenges around the volume of data to be moved around and globally more broadly. Participants also worried that there would be more difficulties in a successful strategy without a single platform for data publishing.

Technological skills were also raised in the complicated discussion with concerns about a lack of educated workers who fully understand the "system of systems". Other challenges that emerged from this discussion also centred on consumers themselves. For example, the amount of data and information that consumers could potentially have to interact with although new products and services may mean that this is not an issue.

Complex Challenges

The complex region dominated the discussion with roughly half of all challenges perceived to fall within this complexity level. Although the majority of the topics discussed at this level included commercial and regulatory aspects, as well as concerns around skills, there was a surprising amount of data standards challenges that were deemed complex. Most of the concerns around data standards were not very specific, with delegates simply mentioning data standards or data quality as concerns, that warrant further investigation to ascertain underlying reasons. Other concerns in this area related specifically to publishing standards, quality assurance mechanism and data credibility.

The most common topics to emerge from the discussion about complex challenges included commercial and regulatory aspects of implementing an open sector strategy. Most of these related to generic commercial concerns about ensuring business buy in into the sector strategy. Discussions took place on barriers, including interference with commercial practices and the sharing of data perceived as commercially sensitive.

Participants raised challenges about legislation around data collection, storage, and a high degree of sharing with specific mention of GDPR. This links in with the internationalism of the UK aviation sector. As an international industry, creating and adopting standards will require wide engagement.

Data ownership also emerged as both a concept and challenge[4]. In addition, issues of trust also arose as complex with concerns about the ideas around trust in general, transparency, equity of benefits and abuse of data.

From a technological aspect, challenges arose about the actual technological requirements of implementation, skills required for success, and linked with other topics, and security challenges facing the sector. Firstly, there were concerns around the different systems used by various airlines and airports hindering the implementation of any meaningful strategy, and the will to make the necessary changes.

A related factor is the fear that without wide and rapid enough adoption, the initiative would falter and not bring about desired benefits. Skills were more prominent in this section of the Stacey Matrix than in others, with general concerns regarding skills alongside specific challenges to effectively collect and extract value from data.

Although data security and cybersecurity were mentioned as challenges, there was little elaboration on what specific issues needed to be addressed. However, given the sensitivity of data about people and national security concerns, this is a well founded challenge that will need to be explored further.

Chaotic Challenges

11 challenges emerged in the chaotic region of the Stacey Matrix. These generally fitted the pattern of challenges that exist far outside the direct control of the workshop participants. These broadly fit into categories around trust and challenges within the regulatory and commercial environments they work alongside. Besides outright stating the perceived chaotic challenge of trust in an open aviation sector, workshop participants also mentioned bias and a fear of loss of control. A fear of loss of control is a typical concern in any open data strategy, and typically requires ethics, equity and engagement from key stakeholders in order to build that trust and succeed in sharing data.

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[4] The ODI recommends that people and organisations think more broadly than a single person or organisation "owning" data, but instead to consider who has rights and responsibilities for it. This might include other businesses, communities, governments or in the case of personal data, individual consumers.

On the commercial and regulatory side, key concerns were raised around competition issues and the global fit of an open data strategy. From a competition standpoint, it is critical to engage with businesses and demonstrate that much greater value is generated from them sharing their data and connecting their core offerings with innovative third party service providers. International cooperation will of course be required for the widest possible success in an aviation strategy. However, the best way to initiate this process is to work domestically for quick wins that gain momentum and improve chances of international success.

General observations and recommendations

An open data strategy for the UK aviation sector has clear benefits for consumers. This aligns with the current view of the UK aviation sector in having a customer-focussed strategy going forward, as outlined in the Aviation Strategy next steps document 'Beyond the Horizon: The Future of Aviation in the UK'. With a greater amount of data shared in the aviation sector, consumers will have an improved passenger experience as they will receive the information they need for their journey in a more timelier manner.

Ideally, the aspiration is that consumers should have the information they need at the various stages of their passenger journey (including different modes of surface access transport) to make the most appropriate decisions. There are clear challenges to achieving these goals, and realising these benefits. Currently there is a significant amount of commercially stored data, a lot of data that is not easily accessible by those that would provide better services, and those that can access data are already the most powerful firms within and outside the aviation industry.

An open sector strategy can emerge by taking small proven steps through solving shared problems that affect companies and consumers, applying data standards, through educating key stakeholders and identifying key infrastructure.

Participants demonstrated a clear level of willingness to come together to tackle shared problems. There was broad agreement to take collective action to tackle the key problem of passenger disruption.

A particularly interesting aspect involved different teams in the workshop taking different approaches to consider how best to tackle passenger disruption. Potential ways forward include helping passengers navigate between terminals during transit, provision of better information to passengers on delays and working with Border Force to speed up passport checks at the UK border.

There was also a substantial discussion on how open data / data sharing could help line up airport services better. Points raised ranged from more dynamic border and ground handling resourcing (to reflect when planes *actually* arrive rather than are *scheduled* to arrive) to lining up onward travel (e.g. lining up taxis, holding the last train for a delayed flight). These discussions clearly show significant potential for collaborative working to break down

organisational silos and tackle common problems. In order to develop and build on momentum, the ODI propose the following activities:

(1) During the period of consultation on the Aviation Strategy green paper and the development of the white paper, DfT regularly convenes the UK aviation sector to maintain an effective monthly forum for collaboration and information exchange. It would be useful to ensure that passenger representatives are present in this forum;

(2) The group conducts further work to further consider the specific issue of passenger disruption and reaching a consensus on key data that needs to be available to help deal with that problem alongside a vision for the future of aviation services;

(3) The group identifies and agrees on steps that need to be taken to tackle the problem of passenger disruption and where to begin tackling this given the range of complex issues;

(4) Each stakeholder carries out an assessment of their own readiness to share additional data in a more open manner. This could be achieved by undertaking the Open Data Pathway assessment;

(5) The group shares data and undertakes a series of innovation activities to develop prototypes for improved data infrastructure and consumer services that can be trialled with different consumers. Implementing data standards is one way to improve data infrastructure.

During the workshop, there were indications that some developments had been made and shared in this space. In particular, Gatwick Airport are developing an application that has already been shared with Heathrow and other London airports to help them understand operational matters that impact on each other. It would be useful to identify and pick out similar examples of initiatives that are already in place that can be scaled to multiple companies / locations.

In our experience, it is useful to have an independent party involved in convening and managing the aforementioned stakeholder group. The ODI has taken on this role across water, energy, pharmaceutical and leisure sectors. The key benefit involves neutralising any vested interests from any particular stakeholder in an open and transparent way.