

Big Data Overview

The Airline Industry



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Status of Big Data Initiatives

The Airline industry has been embracing Big Data initiatives as technological advances have made it easier to do so. Both airlines and airports have been implementing state-of-the-art technology to improve customer experience, safety, and logistics. 59% of airports view improving passenger experience as a key driver of IT investment. As technology continues to advance, airlines are able to collect huge amounts of data from multiple sources. This increase in available data has rapidly put airlines in a position to process data, to develop insights, and make more informed business decisions. However, airlines have had to quickly develop internal processes to gain value from this large sum of data through Big Data strategies.

Over 60% of airlines currently have Big Data initiatives in place. The remaining airlines are currently in the process of putting together Big Data strategies. Airlines share the common goal of using Big Data to gain insight into consumer behavior to better manage customers and create a more personalized experience. These initiatives are primarily driven by the customer relationship management (CRM) and marketing teams. These two teams own the largest portion of Big Data initiatives across the airline industry. This majority is primarily based on the fact that airlines are looking to improve the overall customer experience in order to remain competitive in the marketplace.

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Gathering Platforms

Over 80% of airlines have a Big Data gathering platform in place. The platforms vary depending on the nature and source of the data being collected. Some data is collected through point-of-sale software and some data is acquired through a third party vendor.

The majority of airlines utilize Hadoop. However, a common trend is the usage of multiple gathering platforms depending on the type of data and/or the department that owns the specific data. For the most part, individual departments are not set on a single company-wide platform but rather choose one that works best for its needs.

Types of Data

The complete process of arranging a single flight generates a large sum of varying types of data. The newest Boeing 787 is expected to create up to a terabyte of data per flight. However, that is only a small portion of the 2.5 billion terabytes of data that airplanes generate annually due to the advancements of jet sensors, pilot reports, and air traffic information. Domestic airlines transport over 600 million passengers each year and collect unique data points for each one. Passengers create data through booking flights, check-ins, in-flight purchases and upgrades, checked baggage, etc. This passenger and flight data gives airlines the opportunity to process the data to gain insights and improve operations and overall customer experience.

Transactional Data

75% of airlines rely primarily on structured data from transactions and ticketing information. This is due to the fact that it is readily available and can provide customer insights without having to deal with less-structured data sources. Airlines, such as United, have databases with 30 years worth of transaction history that have held little to no use until now. As Big Data storage and analytics resources become more readily accessible, airlines can now utilize this data to develop more complete views of individual customers. Therefore, airlines are interested in growing current customer databases to store more insights about both loyalty members and non-loyalty members.

Loyalty Cards

A major data source that airlines are accessing is customer loyalty cards. Airlines with the largest loyalty card programs generate 100-200 million in revenue from these transactions. There are both positive and negative aspects of using loyalty program

data to generate customer insights. The positives are that airlines can gain more insight into customer behaviors based on the type of credit card they use, the types of purchases are being made, and how often these purchases are being made. However, loyalty cards do not account for all buying behavior and can often be difficult to match to the correct customer's profile, especially if they are not using that card for all airline reservations. Also, airlines cannot access all customer data from these cards due to privacy restrictions. However, because of the scale of these loyalty programs, airlines are able to utilize a good portion of data to help create more detailed customer profiles.

Mobile

Mobile technology has increasingly begun to infiltrate all aspects of everyday life including air travel. 100% of Fortune 500 airlines are already using mobile applications for a variety of functions. These functions range from check-ins, booking and accessing tickets, flight status updates, etc. Mobile applications are expected to account for 70% of sales, 91% of customer service, and 71% of passenger processing by 2015. 90% of airline check-ins already come from online or mobile sources. Airlines recognize this opportunity and 95% rate mobile services for passengers as a key investment priority. While mobile holds many opportunities for airlines to access additional data, there is still the issue of collecting and generating insights from this non-conventional data source. Issues include integrating mobile with current data gathering platforms, integrating mobile with airports that do not yet have the technological capabilities, and analyzing mobile data.

Social Media

Social Media is another non-conventional data source that airlines are interested in utilizing but hesitant to do so for multiple reasons. At least 25% of airlines are interested in expanding further into social media. 100% of Fortune 500 airlines are already using social media in some way. Social media is appealing due to the low costs of implementation but it presents a problem when looking to gather data and insights. 90% of airlines intend to promote their services using social media over the new few years but are unclear whether or not it will become a focus within their Big Data strategies.

Uses for social media data in the airline industry include building customer profiles, gaining insight into customer sentiments towards the brand, resolving issues more quickly, and generating personalized offers. Airlines indicated that if they are not already using this data, they would be more inclined to do so if they knew how to gather and use the data more efficiently.

Demographic Information

Airlines indicated an interest in accessing and utilizing more demographic data to create more complete user profiles to better target specific groups of customers. Airlines do not have a reliable source of demographic information since passengers are not required to disclose that information when booking tickets. Therefore, airlines must rely heavily on third party sources for this data. Even with access to demographic information, there is still the obstacle of matching the information with the corresponding customer or integrating the data with internal sources.

Flight Data

There is a significant amount of flight-related data that is produced by airlines themselves or that is available from airports and other outside organizations. This data can be used to improve safety, operational efficiency, on-time performance, and logistics. Flight-related data includes:

- Jet sensor data that detects surrounding conditions such as temperature, humidity, and air pressure
- Weather conditions such as visibility, temperatures, wind direction and speed
- Airport geo-location databases, runway configurations, and gate layout plans
- Air safety reports from NASA, FAA, and NTSB
- Crew scheduling data such as shift regulation, aircraft-specific requirement, and union restraints
- Fuel consumption data

Data Storage

The airline industry has a highly complex IT environment due to numerous systems involved in a wide variety of operational processes. Compared to other industries, technology in the airline industry has not been consistently updated over the years, which is now becoming an issue as airlines are increasingly forced to rely on technology to remain competitive as Big Data becomes more important. The competitive advantage found in technology is only temporary since technology and data is evolving so quickly. Airlines rank data storage as a very important aspect of their Big Data strategies.

The majority of airlines are still relying on data warehouses as the primary means of storage. However, 60% of airlines are either interested in cloud storage or already making an investment into it. Cloud storage is appealing due to the cheaper cost, increased efficiency, and the flexibility to manage the complexity of Big Data across a large-scale network. The main concerns of cloud storage are integrating it with current systems and privacy since most clouds are internet based. If these concerns were to be addressed, the majority of airlines would prefer to rely on cloud storage.

Industry Trends

Cheaper Storage

The declining price of storage solutions, especially cloud storage, has given airlines an incentive to store and process more of the data that they create. Previously, data insights did not seem important enough to justify the exorbitant cost of storing all of it. However, storage prices are now reasonable enough to convince airlines that there is much to gain from storing and processing large amounts of data.

Competition

Competitive advantage due to technology is only temporary in today's world. Many airlines developed Big Data strategy after other industries began thriving and are now struggling to update hardware to match their storage and processing needs. Airlines are

facing pressure to update their technology not only for Big Data capabilities but also to provide a better customer experience. As an example, 75% of airlines will deploy crew service tablets by 2016 to have more data right at their fingertips. The goal is to have passenger and flight data more readily available to improve the overall flight experience. Airlines must keep up with these types of advancements to remain competitive.

Privacy Regulation

Privacy is becoming an ever-increasing concern due to the fact that companies are able to freely collect personal data from a variety of sources. The government is putting more and more regulations in place to protect customer data and ensure privacy. The State of California lodged a complaint against Delta Airlines for collecting personal information from mobile apps without notifying users. Therefore, airlines must be stringent in adhering to privacy regulations when putting Big Data gathering processes in place to ensure users are opting-in to data collection and usage. Airlines must also be careful when storing and accessing customer data to ensure that privacy and legal policies are adhered to.

Applications

Customer Relationship Management (CRM)

47% of Fortune 500 airlines use Big Data to improve CRM. Big Data can help airlines get a more complete view of their customer to improve personalization and loyalty. One example of this is using prior purchasing data to make recommendations and encourage future purchases. Only 3% of airlines believe they actually have a complete understanding of individual customers and 20% have multiple conflicting views. Airlines want to use Big Data to help close this gap and create more complete customer profiles. One airline is even utilizing speech analytics to extract information from live-recorded interactions between customers and personnel. By understanding complete customer behaviors, airlines can generate offers and services that more closely align with what customers want.

Airlines are dedicating more efforts to creating a personalized experience for their customers. Personalization is becoming a major aspect of improving customer experience and increase loyalty. 78% of airlines already offer personalized services to their passengers or are planning to do so by 2015. Mobile services and social media play a major role in enabling personalized approaches. Over 90% of airlines are planning to invest in mobile services by 2015 to improve passenger satisfaction throughout the entire flying experience. By integrating mobile into the overall day of departure experience, passengers have a more seamless experience and airlines can tailor messages and offers to their individual interests and needs. This can help airlines and airports recognize passengers, guide them through the airport, notify them of delays and gate changes, etc.

However, airlines do not have full control over everything that goes on during the day of departure. For example, they cannot control the experience of going through security which is a major point of dissatisfaction for passengers. One way airlines are able to combat this discontentedness is by working with airports to create a better overall experience. Airlines can integrate technology, especially mobile, with airports to create a better and more connected experience for customers throughout the entire process.

However, 57% of airports lack the system integration capabilities to support new technologies and this must be addressed before airlines can take full advantage.

Marketing

33% of Fortune 500 airlines use Big Data to make more informed marketing decisions. These initiatives often go hand-in-hand with the CRM initiatives but ownership falls under a different team. Big Data is an important factor in making marketing decisions because it allows employees to make faster and more accurate decisions. Marketing teams can utilize real-time data such as social media to improve customer experience by personalizing campaigns and offers to unique customer segments. By analyzing real-time data, airlines can resolve issues immediately and monitor customer sentiments to improve brand positioning. One example, as related to flight behavior, is selling more Economy Plus seats by targeting the right consumers with the offer. This

allows airlines to increase sales by marketing an offer to the proper customers. It also allows marketers to know what products to promote to which customers via what channel to increase conversions and customer satisfaction. Big Data allows marketing teams to achieve overall business and revenue objectives by helping them to make more informed decisions faster than they could have before.

Operations and Logistics

20% of Fortune 500 airlines use Big Data to improve operations and logistics. By utilizing the data the jet sensors produce, along with pilot reports and air traffic information, airlines can optimize operations to improve on-time percentages and decrease costs. Potential operational uses include:

- Tracking and routing aircrafts to minimize delays.
- Planning flight schedules, fares, and which flights to cancel.
- Addressing fuel shortages and determining optimal amount of fuel to use.
- Tracking baggage to cut down on transfer time and minimize lost baggage.
- Monitoring runways for safety issues.
- Allocating and routing on-ground vehicles and assign crews.

Up to 64% of airlines plan to share data with ground service providers and airport operators by 2015. Providing real-time data to the on-ground workforce will help minimize disruptions to airport operations. Frontline workers would be able to receive real-time dashboards related to operational and strategic goals to better understand how to improve performance.

Issues & Improvements

Hardware

Airlines face a variety of issues and concerns when developing and implementing Big Data strategies. Only 7% of airlines say they face no challenges in implementing their

Big Data strategies.

The number one issue is hardware, with 31% of Fortune 500 airlines listing this as their main concern with implementing Big Data. Hardware obstacles include price, privacy, and capabilities. Some airlines are dealing with outdated hardware and must weigh the pros and cons of the different options and costs to upgrade. Other companies are interested in upgrading to hardware with more capabilities to meet their needs but also must balance potential options with the costs. Either way, companies must explore multiple options to determine what is best for their individual needs and budget constraints. However, sometimes the costs and efforts required to upgrade systems do not justify the business objectives behind implementing Big Data and companies delay making improvements.

User Knowledge

The second biggest concern is user knowledge with 25% of Fortune 500 airlines citing this as an issue. There is no singular definition for Big Data so this can cause disconnect across the company if there is no uniform definition to base initiatives off of. Many people still do not understand what Big Data is and if they do not understand it, they cannot implement it. Also, having a lack of employees with the talent to manage, process, and analyze Big Data can be a setback. An airline may be interested in implementing some form of Big Data platform but may not have the internal talent to use it.

Data Quality

The third largest concern Fortune 500 airlines have is quality of data with 19% listing this as an obstacle. Many airline companies have dealt with mergers and had trouble integrating one company's data with another. Data fragmentation often occurs due to differing technology platforms. This can also come into play with airlines trying to use third party data to supplement their own internal data. Also, with the addition of non-conventional data sources like social and mobile, the mix of data is often difficult to

process and integrate. Therefore, this is a major concern to airlines because without quality data they cannot develop impactful insights.

Additional Concerns

Additional concerns include lack of time and having a clear strategy. Scaling up new systems requires time especially if different data sets need to be integrated. Time is also a factor when processing data. Some systems do not process data as quickly as the airline would like. The more time it takes to process the data, the more time it takes to generate insights. Airlines face constant pressure to keep up with the competition and cannot afford to have Big Data processes that are highly time-consuming.

Having an unclear Big Data strategy can be a major setback in generating insights that can make the biggest impact on business objectives. In many companies, individual divisions own their operating system, data, and strategy but do not share data or insights across divisions. 97% of airlines recognize the need to improve the sharing of data across the company and have plans to do so by 2015. Mixed ownership of initiatives can lead to issues defining how to manage strategies internally.

Buying Process

The majority of airlines have varying Big Data initiatives across the company. However, the majority are owned by the CRM and Marketing teams who work closely with departments that have more technical expertise like Engineering, Enterprise Data, and Business Intelligence. Usually, one department does not own the Big Data strategy for the entire company. Individual departments tend to make buying decisions regarding Big Data tools and platforms on their own. The buying power is held by the individual business unit leaders and engineering or IT departments, oftentimes between the Director and Senior Vice President levels.

The fiscal allocation for purchasing Big Data tools and platforms is taken from a portion of the overall department's budget. This budget is usually money that is set aside to

expand department initiatives. The most common budget range is between 5-10 million but it is up to business unit leaders to determine what portion of this is spent on Big Data.

Since Big Data is still fairly new, there is little information on Return on Investment. Therefore, budgets are determined by how Big Data strategies can accomplish business objectives. Business units and Big Data leaders must market the individual initiatives to executives to convince them that it aligns with company goals and can help accomplish them.

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Figure 1.1 addresses the elements, which airlines believe are most important when deciding which Big Data tools to purchase. Each component is ranked on a scale of 1-7 with 1 being unimportant and 7 being essential.

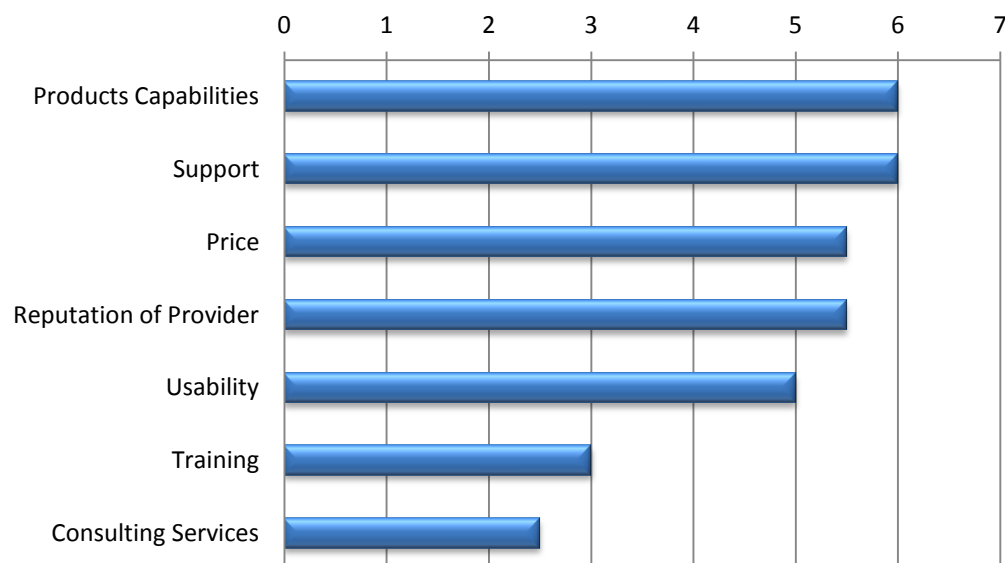


Figure 1.1

Partnerships

Each airline partners with a wide variety of outside vendors for storage solutions, analytical tools, and third-party data. A common trend is that a company will have one overall Big Data vendor but work with other vendors throughout the company on individual initiatives. Common partners include:

- Teradata
- IBM
- SAS
- HP

Additional partners include:

- Aspect
- Axciom
- Experian
- Gemfire
- SiteScope
- Sybase
- TIBCO
- Wunderman