

NDC based Airline Retailing Transformation for Airlines.

A Practical Guide



Airline retailing is undergoing a transformation with evolving adoption of the New Distribution Capability (NDC). NDC is revolutionizing the way airlines distribute their products and services by enabling more personalized and differentiated offerings through indirect channels and, ultimately, the travelers they serve.

While NDC offers new possibilities and various opportunities for airlines, it necessitates investment in technology and process change to ensure effective market penetration and adoption, and a material growth /shift towards NDC transactions. This investment is needed not just by airlines but across a wide spectrum of participants in the travel marketplace, from suppliers to sellers and buyers.

This airline focused White Paper complements a previous two-part NDC publication created by DataArt and Cornerstone that focused on travel distributors, addressing (in Part 1) the definition and characterization of different distribution models faced by TMCs, OBTs and OTAs; and a solution architecture for the NDC journey; and (in Part 2) servicing and management of NDC transactions for the indirect channel; how the NDC record differs from the traditional EDIFACT PNR; and the operational capabilities of NDC through various channels. You can find these publications [here](#).

The purpose of this document is to share practical, actionable insights and information for airlines and their partners about NDC. The DataArt Travel R&D team researched NDC technologies, processes and strategies used by airlines, and assessed some of the challenges faced by airlines that inhibit the pace of adoption and compiled some opportunities for accelerating NDC market penetration.

NDC is moving fast, with almost daily changes and enhancements. And every operating environment is different, so the specifics will vary from operation to operation. This Paper is a snapshot representing our assessment at this point in time and is meant to provide a useful foundation for planning, execution and future dialog. As a result, we cannot guarantee the absolute accuracy of the information. Readers should think of this as a springboard to validating and reassessing NDC strategies, processes, and technology approaches, which should include directly validating the information as it applies to each specific context.

We are pleased to share our insights and recommendations for NDC based Airline Retailing Transformation journey and look forward to any feedback you have for continuing to improve this document.

Please [contact us](#) to set up a discussion on planning your successful NDC roadmap.

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1. The Objective of this White Paper

This White Paper represents the collective understanding of DataArt on the ever-evolving landscape of NDC. DataArt's Travel R&D team and airline industry experts are constantly observing the latest developments related to NDC and are working closely with our clients to develop and deploy effective NDC solutions.

This Paper complements [a two-part series of NDC White Papers](#) prepared in partnership with Cornerstone Information Systems, that were focused on the opportunities and challenges faced by TMCs, OBTs and OTAs with NDC adoption. In this Paper, we turn our focus towards airlines and their vision and goals for NDC distribution.

Key topics for this White Paper include:

- A.** An overview of NDC and the opportunities that NDC adoption presents to airlines.
- B.** A contextual review of airline retailing, both direct / indirect, and the breadth and complexity of the technology needed by airlines to evolve to modern offer & order-based retailing to present & distribute their product to the marketplace.
- C.** An assessment of current market adoption of NDC.
- D.** A review of issues and challenges impeding NDC adoption.
- E.** An outline of strategies to mitigate challenges and accelerate adoption.

2. About NDC

2.1. What is NDC?

New Distribution Capability (NDC) is an initiative launched by the International Air Transport Association (IATA) to develop a new XML-based data transmission standard for airline distribution and communication. By establishing a direct link between airlines and travel agencies as well as other distribution channels, NDC offers improved connectivity between the buyer and the seller and is designed to offer customers a more effective and customized travel experience. NDC enables airlines to offer differentiated products and services on the indirect channels, such as real-time seat upgrades and dynamic pricing, in a similar way to the retailing practices they can adopt on the direct channel.

NDC has been steadily adopted by a significant number of airlines, but this adoption has been slow due to various challenges, including technical complexities, the pandemic travel slowdown and ever-changing travel industry priorities. As of the time of writing this Paper 70 airlines are NDC-certified, representing more than half of IATA passenger volume. ([Source: IATA](#))

2.2. Why are Airlines Interested in NDC?

We shall list some of the outcomes and benefits of NDC adoption in the following section. First, let us reflect on the market evolution towards NDC. Knowing what NDC is, now gives rise to a question of why. Why are airlines interested in NDC?

The motivations behind the desire to progress towards NDC vary significantly by carrier, their business model (LCC, Hybrid or Full-Service Carrier), the markets they serve and their relationship to their GDS partners. There is a lot of history here and many factors, but we shall focus here on the following two major influencers:

- a. Airlines are striving to become modern digital retailers, and match and extend the versatility and ownership of brand, product, and pricing they have in direct B2C channels across and into their indirect distribution landscape, and**
- b. A balance sheet desire to control and reduce indirect channel distribution costs. We shall go into these dynamics below.**

Modern Digital Retailing: Airlines are harnessing technology and data analytics to better understand customer preferences and behavior, to transform air travel into a more customer-centric experience (in a similar way to consumer retail and digital eCommerce in the wider marketplace). Airlines own the pace of development and enhancement of the consumer retail experience for their Direct channels, but conversely have little to no control over the shopping and retailing processes within the GDS. This has led to a wide disparity between the types of products, services, and pricing that airlines can promote directly to consumers and the revenue contribution it drives, versus the indirect distribution channels. We highlight 3 key areas of focus for airlines below.

- **Dynamic Pricing:** Airlines are advancing solutions to augment their pricing dynamically to the shopper. AI & ML based technologies can enhance & embed logic within Pricing and Revenue Management solutions to guide Revenue Management (RM) teams to present the optimal price to a traveler to optimize shop to book ratios, drive improved retail conversion and maximize yield and revenues.
- **Personalization:** To enable the progression of Dynamic Pricing, airlines are using and consuming data, analytical tools and insights gained from travel and shopping history. They can aggregate loyalty, travel history, shopping and flight search history, and trip purpose segmentation to gain insights to curate personalized offers for the airline's products and services. This can now happen, in real-time, in path / session while the traveler is shopping / exploring their travel options.
- **Bundling, Packaging and Upselling:** On their direct channels, airlines can ex-

periment with the scope and definition of their brands, branded fares, and associated products with great versatility. They own and manage traveler communications and marketing their products and services, and the value associated with these brands and fares directly with travelers, so they know what service they are purchasing and expect to receive during their trip. Airlines have direct control as to how these brands and services are represented across their digital footprint externally to travelers (web & mobile) and internally to customer service agents, call center and ticketing desk employees.

Figure 1. below highlights the kind of product and brand differentiation that is available to airlines. In their Direct channel they have the ability to fully control and define pricing and the associated services within each brand and how each is represented, whether it forms part of a bundle or brand, or if it's sold as part of the shopping flow and added to the cart as an upsell opportunity. In addition, airlines have control over the retailing of third-party ancillaries such as hotel accommodations, transfers, car rentals and trip insurance that can be embedded within their direct channel shopping flows.

| | Basic Economy | Economy | Premium Economy | Business Class | First Class |
|---------------------|----------------|---------------------|-----------------|----------------|-------------|
| Carry on | None | Free | Free | Free | Free |
| Checked bag | \$30 | \$30 | \$30 | 1 | 2 |
| Seat selection | Not available | Available for a fee | Free | Free | Free |
| Advance change | Not allowed | For a fee | Free | Free | Free |
| Same-day change | Not allowed | For a fee | For a fee | Free | Free |
| Cancellation | Non-refundable | Credit for \$100 | For a credit | Free | Free |
| Upgrade eligibility | Not available | Not available | Available | Available | Available |
| Priority boarding | Standard | Standard | For a fee | Free | Free |
| Priority check-in | Standard | Standard | Standard | Standard | Standard |
| Lounge access | Not included | Not included | Not included | Included | Included |

Figure 1. [Source: ATPCO]

However, challenges exist within the traditional GDS marketplace and EDIFACT based retailing in all 3 of the areas highlighted above that either limit, constrain or prevent airlines in achieving their goals and agendas for providing a modern intelligent, digital retailing experience.

While the GDSs work and partner with airlines to ensure their brands, fares, products, and services are

presented and rendered correctly within the GDS retailing landscape, there are many challenges, complexities, and delays with deployment across the GDS environment, even when your PSS providers is one of your GDS partners.

- **Via the traditional GDS process**, brands, fares and prices for core ancillary products and schedules are filed publicly and are fairly static in nature. Subject to data subscription and solutions / systems with sense and detect logic, an airline can see and respond to competitive pricing changes when published and respond accordingly with pricing adjustments and / or opening or closing fare classes, which need to be re-filed / published back to the marketplace.
- **Via traditional GDS shopping processes**, the logic and compute capacity for EDIFACT based shopping and retailing used to create priced itineraries is all managed within the GDS technology stack. As a result, the airline does not gain any insights as to who the shopper is until end-transact / post booking, with little or no opportunity to curate personalized offers.
- **In the indirect marketplace, comparison shopping** is a primary focus - presenting to the shopper content / fares / itineraries from multiple carriers for comparison and evaluation. Within the GDS and across their subscriber base, it is a constant struggle to accurately represent the scope of each brand, fare / products and bundles curated and offered by each airline. Mistakes are made, and this can impact revenue, booking volumes and market share for an airline. It can be a continuous source of effort on the part of GDS and downline booking tools to invest and update their technology to consume and render the new, rich content needed to accurately represent an airline's products, and a source of tension with the airline, when they do not.

There are initiatives within the industry to improve the management of the complexity of new brands, products, and content, to standardize how branded fares & brand attributes are filed to permit comparison shopping. **Figure 1.** above is an illustration of how products / brands could be collated and rendered within the traditional GDS and NDC shopping environments. The industry efforts of the "Shelves" program is ongoing, in coordination and partnership with ATPCO.

- **The Attachment Rates** for retailing and upselling an airline's ancillary products and services have traditionally been very low within the GDS. The booking paths of many TMCs, Agencies, OBTs and OTAs do not or cannot embed an airlines product catalog in path of the booking flow. Presently, retailing ancillary products and services is rarely incentivized within GDS agreements. The TMCs, Agencies, OBTs and OTAs are focused on selling and servicing their clients' needs with a wider set of products and services from multiple sources from which they make money. There is therefore a commercial and often technical disconnect here.

• **Price differences can emerge** for the same flight itinerary / brand / class of travel between travelers shopping via an Agency, OTA or Meta search engine, and fares presented on an airline's website. This can sometimes be driven by errors caused by technology challenges. TMCs and Agencies do not like seeing lower fares available outside their booking environment, as volume can spill into direct bookings. Sometimes this can be intentional, to incentivize channel shift to direct booking and avoid GDS fees and incentive payments, where permitted by content obligations between airlines and sellers.

This commentary highlights the challenges faced by the airline as they invest in new brands, products, and services, to evolve and differentiate their offering and Go-to-Market messaging with travelers. There is often a disconnect between the pace and agility for deployment and adoption in their direct-to-consumer channels when compared to indirect distribution.

Cost of Distribution: There has long been tension between airlines and GDS regarding the cost of distribution – the booking fees applied by the GDS for itineraries & travel content sold from inventory made available from within their marketplace. It is a significant expense incurred by airlines and has become a sustained focus for cost reduction. We shall not go into the arguments for the value GDS providers believe they bring, connecting the content and inventory of hundreds of airlines, thousands of hotels and car rentals sites (sellers) to tens of thousands of travel sellers across the world (buyers).

NDC has become an enabler for many airlines to distribute their content, products, and inventory directly to travel sellers and reduce their cost of distribution, while at the same time shifting volumes from traditional EDIFACT based GDS retailing to modern NDC based distribution. Some of the benefits and opportunities for airlines are highlighted below.

2.3. What Benefits Could NDC Adoption Drive for Airlines?

The following are some of the key business drivers for airlines, and for TMCs and OTAs subscribers to the airline's NDC content.

Benefits for TMCs and OTAs

- **Inventory access:** NDC provides OTAs and TMCs with improved access to airline inventory, including real-time availability and pricing for flights and seats.
- **Personalization:** NDC enables travel agencies, OTAs, and TMCs to offer their client more personalized travel options, especially if the loyalty status is made available by the airline.
- **Ancillary revenues:** Subject to new commercial terms and incentives being established, NDC provides travel agencies, OTAs, and TMCs an opportunity to offer retail ancillary services and potentially fare bundles for their clients.
- **Independence:** Freedom from resource and expertise needs and constraints of legacy data formats, constraints and limitations (EDIFACT) and messaging networks and infrastructure, and autonomy to innovate on modern technology.

Benefits for Airlines

- **Greater control:** NDC provides airlines with much greater control over the content and offers greater standardization and normalization of offer generation between direct and indirect channels.
- **Cost savings:** Airlines can reduce their distribution costs by communicating directly with travel agents and other distribution channels.
- **Improved efficiency:** NDC enables real-time communication between airlines and travel agents, potentially streamlining the booking process and reducing the likelihood of discrepancies.
- **Innovation:** NDC fosters innovation by providing more opportunities for airlines to bring new products and services to the market. These can be developed, tested and deployed faster and with much lower cost.
- **Customer Insights:** NDC will bring new customer data & information to airlines during shopping and booking that they did not have before, permitting them to generate new insights and tailor new products & experiences.
- **Personalization:** NDC enables airlines to offer personalized travel options to consumers that leads to increased customer loyalty.
- **Revenue Growth:** Personalized and dynamic offer generation during retailing will permit airlines to grow revenue, with increased revenue capture of base fare revenue and increased earnings from ancillary products and services, either packaged within offers, or increased attachment rates during and post booking.

<https://www.dataart.com/cornerstone-ndc>

3. Airline Flight Distribution Models

An airline’s technology landscape can be complex. From a singular source or record of both available and sold inventory embedded within the airlines PSS or CRS, the airline must expose, authenticate, manage, and integrate the simultaneous retailing of their inventory across numerous direct and indirect distribution channels. As modern, intelligent, digital retailing evolves, airlines need to make significant technology investments to maximize the market penetration of their content and inventory to their partners and travel sellers, employees, and travelers / consumers.

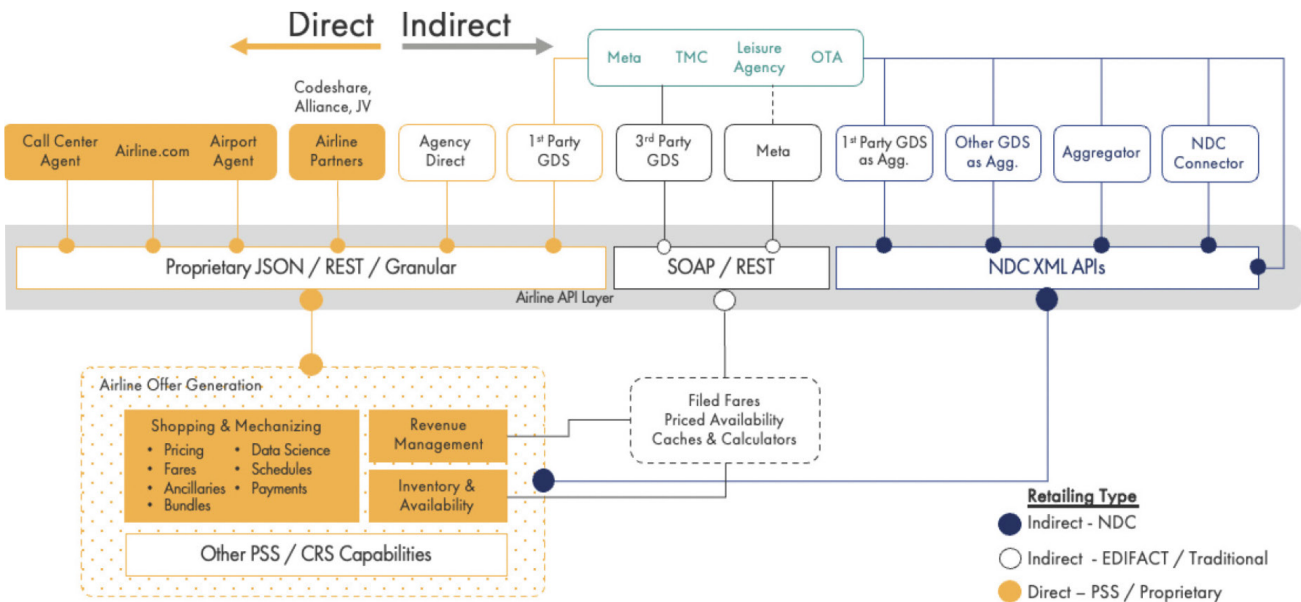


Figure 2.

Figure 2. above highlights the potential breadth and complexity faced by airlines in controlling access to their inventory & products via direct and indirect channels. In an ideal world these points of connection and integration for retailing, servicing and fulfilment would be facilitated and orchestrated via a common, standardized, flexible set of APIs and workflows. The reality is that every point of connection has the potential to be different in subtle ways in terms of the supporting technology stacks, maturity, and diversity of the various web / mobile UX environments presented to shoppers / travelers and employees in either direct or indirect channels.

Depending on an airline’s business model, LCC / Hybrid vs. Full-Service Carrier, and their history in the marketplace, this landscape could be significantly simpler or even more complex than illustrated.

The API technologies used, and the configuration of shopping and retailing flows supporting offer generation are for the most part provided and maintained by the airline’s PSS provider for Direct Distribution, and

traditionally by the GDS with PSS integrations for Indirect Distribution. As we have noted in section 2.2 and seen in **Figure 2.** above, NDC based Indirect Distribution can enable airlines to take greater control of the orchestration of shopping, retailing and offer generation. The evolution of processes and systems that conform with NDC standards, and the technology investment required are two of a broad range of challenges faced by an airline. This will be the focus of this Paper going forward.

3.1. Traditional GDS / EDIFACT Distribution

We are not going to spend much time reviewing legacy or traditional / EDIFACT GDS distribution processes other than to highlight the difference between inventory access and availability when your GDS provider is also your PSS provider. For example, with an Amadeus Altea PSS solution deployed and product distribution via the Amadeus Travel Marketplace (and similar for the SabreSonic PSS and Sabre GDS) we highlight that the first party GDS will have direct access to live or real-time availability & inventory within the airline's PSS system. However, if the airline also distributes to other third party GDS environments, inventory & availability access is typically drawn from proxies, caches and calculators, supported by polling to update inventory counts, and real-time availability is only validated at the time of sale.

For traditional GDS shopping, the GDS manages all the shopping volumes and creates the offer for the shopper based on published schedules, filed fares, the latest availability counts for each inventory class, and the associated ancillary services (if published by the airline), capturing fares and flight data from multiple airlines simultaneously, aggregating and normalizing the results for presentation back to the shopper.

The shop is fully orchestrated within the GDS technology stack and by contrast to NDC retailing, fully outside of the airline's technology stack. The size, scale and extent of the compute capacity for the travel marketplace is owned and managed by the GDS.

One fundamental change shift or change when moving forward with NDC based retailing, is the shift of technology expense and computing cost from the GDS to each airline, where at maturity they will be exposed to the full extent of shopping within the travel marketplace.

3.2. NDC Distribution Models

Indirect distribution via NDC APIs and connectivity **enables the airline** to curate the offer and represent their products and brands back into the shopper within the travel

marketplace in a similar fashion to that of the offers they can present to direct shoppers via their company websites. There are several points of connectivity an airline can consider when seeking to promote / sell their NDC content to buyers in the travel marketplace. We shall characterize each of these below.

In a perfect world the airline would be able to create a single, granular, flexible API stack that all interested parties to the airlines content could consume but the reality is in these early days of NDC adoption there are significant differences and challenges experienced by each of the stakeholders involved in this marketplace.

3.2.1. NDC via a PSS / GDS Partner – 1st Party Aggregation

When a GDS provider is also your PSS vendor they can provide NDC connectivity to their airlines with some unique, proprietary level connectivity and inventory / availability access that would not be offered to other sources. Having a common technology stack for the orchestration of shopping & retailing and the creation of optimized and personalized Offers, enables greater standardization of offers across Direct and NDC channels.

With 1st Party NDC aggregation, the GDS retains responsibility for 1 to many shopping with other airlines in the marketplace and dealing with the complexity of consumption, normalization and consolidation of shopping results, as they do today, from both NDC and traditional shopping requests.

Examples: Altea PSS & Amadeus Travel Marketplace; SabreSonic PSS & Sabre GDS.

3.2.2. GDSs Acting as an NDC Aggregator

The GDS can act as an Aggregator of NDC Content, sending and receiving shopping results directly from the airlines' retailing technology and aggregating and normalizing the results alongside equivalent shopping results from other airlines. This could involve the representation of both NDC offers and traditional offers within the same shopping environment.

The individual airline wants to manage a single or common set of APIs for inbound / outbound connectivity to each GDS / entity. The GDS likewise would prefer to work with standardized sets of API schemas. Each GDS however is working for hundreds of airlines, and each airline is at differing levels of maturity in the development and adoption of NDC API schemas and workflows. To make NDC content available to each GDS,

each point of connectivity and each set of capabilities and services enabled could result in a need for differentiated APIs for each GDS or limit the breadth of the services and capabilities offered if the airline and GDS APIs and workflows do not yet provide full interoperability.

Examples: Amadeus & Sabre, when not acting as a 1st Party Aggregator; Travelport; TravelSky.

This has traditionally been a strength of the GDSs, the consumption of disparate content and consolidating and normalizing it for an effective comparison-shopping experience for buyers. GDSs are working and investing to be able to ready and able to manage API and workflow connectivity to consume an airline's NDC content, regardless of or agnostic of schema version, to streamline and simplify adoption. This requires a complimentary investment by each GDS while maintaining investment existing infrastructure in parallel. A work in progress.

3.2.3. 3rd Party / Independent Aggregators

A marketplace has developed that can enable an airline to distribute its content to the travel marketplace independently from GDS-based distribution, traditional or NDC aggregation by GDSs - the emergence of independent third-party aggregators or content consolidators.

As we discussed in our other Paper, Aggregators therefore take on the responsibility of consuming NDC content from multiple airlines and consolidating it into a retailing environment for travel consumers / buyers to explore. In this environment the airline remains in control of offer generation, as the aggregator passes the shopping request to each airline, and then consumes and consolidates shopping results on behalf of the entity that is shopping, being an OTA, travel agency, OBT or TMC.

We have the same dynamic as above where an Aggregator will seek to standardize their technology stack on a common set of NDC based schemas / APIs and orchestrate shopping requests and results to / from multiple airlines using the same schema. However, it is far from certain that each airline in their community has the same level of business process and API development or maturity to support the full gamut of retailing and servicing capabilities. Here Aggregators can add significant value and solve challenges from both the airline and the buyer / seller side of the value chain, when they likewise invest in capabilities that are agnostic to or interoperable with multiple API schema versions.

For an airline to embrace a portfolio of multiple aggregators however, again there is a risk of needing to maintain multiple versions or multiple points of connection for each aggregation partner, each supporting a unique API regimen for a specific aggregation partner or live with functional limitations in the short to term while maturity and interoperability is achieved.

Examples: TP Connects; Duffel; Travelfusion; Mystifly; NuFlights; Spotnana.

3.2.4. Independent NDC Connectors / Gateway

In addition to the emergence of independent aggregators and consolidators of NDC content, a market has developed for technology partners that standardize NDC connectivity on behalf of the airline. They provide deep integration with an airline's shopping and retailing technology to orchestrate offer creation and order servicing. They also manage and facilitate the inbound / outbound connectivity to the marketplace as a single point of connection to all parties interested in accessing the airline's content.

This can take the burden and expense of management of a complex set of retailing and servicing APIs and the differing versions of NDC schemas / maturity of processes and workflows out of the hands of the airline and into the hands of their partner. This provides the potential for an airline to provide one front door through which all sellers could subscribe and connect. A GDS wishing to consume and aggregate NDC content, could be also pointed out here. This partner may also have technology that could form part of the retail orchestration, to protect the PSS from a surge in volume. The compute capacity for NDC shopping and retailing does need to go somewhere.

The same challenges remain however within the travel marketplace amongst TMCs, Agencies and OTAs etc., for their ability to consume that content from the NDC connector / Gateway established by the airline, with API schema version miss-matches and workflow anomalies, that the Connector / Gateway partner may need to manage, on behalf of their airlines.

Examples: Accelya; PROS; Datalex.

3.2.5. Develop & Expose Your Own NDC APIs

In this last scenario an airline exposes their own NDC APIs directly to the travel marketplace and specific sellers of their content. As illustrated in **Figure 2.**, where some agencies are afforded direct access to core services within the PSS retailing stack, direct

connectivity to an airlines NDC retailing stack would also afford TMCs, agencies and OTAs, etc., direct access to airlines retailing capabilities for their customers, and significantly improved access to real-time inventory and availability.

As noted in our other Paper, significant challenges are faced by key actors in the travel marketplace in taking on responsibility for managing the consumption of multiple NDC points of connection with multiple airlines and taking on the responsibility themselves to aggregate, normalize, and consolidate shopping results for presentation to their buyers. In this scenario, they take on the responsibility of managing the complexity of API schema and workflow differences / maturity of each airline and as a result, airlines have not seen a lot of adoption of this type of connectivity by travel sellers.

Examples: In-house Development; PSS partner / vendor development.

Some airlines have made significant investments, especially with local agencies in domestic markets. While this may be attractive to airlines and has been accomplished by many, adoption and subscription by travel sellers directly to airlines' NDC APIs have been low.

Sections 3.2.4 and 3.2.5 could collectively describe how travel sellers access an airlines content directly, so called **Direct Connect** access to airline inventory and priced availability where offer creations come directly from the airlines retailing stack, either via an API stack orchestrated and managed in conjunction with a partner, or an API stack developed and managed by themselves and / or their PSS partner.

Please find below links to our two prior NDC White Papers, focused on NDC Adoption within the TMC, OTA, Agency travel seller marketplace:

- [NDC Adoption Unveiled: The Practical Guide for OTA, Corporates and Agencies in Airline Retailing Transformation](#)
- [NDC Adoption Unveiled: The Current State of Servicing of NDC Transactions](#)

4. NDC Adoption - Reflections & Considerations

For airlines to fully realize the benefits of NDC as highlighted in Section 2.3 of this Paper, they will need to overcome many of the NDC implementation and adoption challenges and hurdles discussed above. So how are things going? What is the extent of market penetration that we are seeing from NDC bookings? Is NDC delivering the value that is expected? What actions or paths can an airline take to enable and maximize adoption and market penetration? We will explore these issues in this section.

Airline Adoption

IATA publishes a registry on the progressive qualification and adoption of NDC retailing capabilities, and the maturity of the APIs supporting these business processes. The Airline Retailing Maturity (ARM) Index provides airlines and their partners with better visibility of their own and other organizations' retailing capabilities supporting the key functions of Shop, Order, Pay, Settle, Account & Setup.

Here we see that 70 airlines out of the 317 airlines IATA represents have published and received validation of one or more APIs that conform to a published IATA schema for that business function. Correspondingly, there are 21 businesses who have received validation of NDC schema conformance to sell NDC content.

| IATA Qualified Entities | |
|-------------------------|----|
| Airlines | 70 |
| Sellers | 21 |

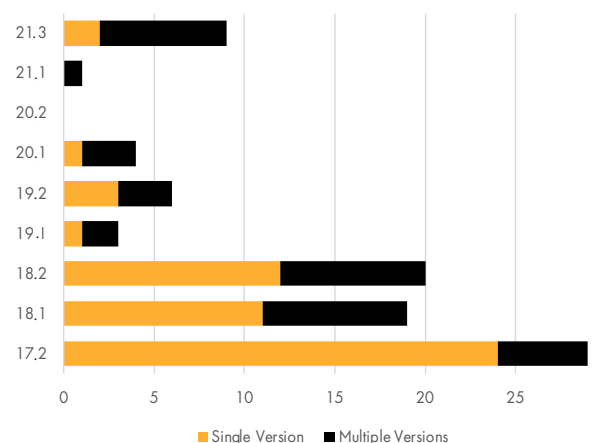
To support the complexity of indirect distribution via NDC, there is a very active IT systems / vendor marketplace, with significant ongoing investment to serve & support the NDC distribution needs of airlines or travel sellers.

| IT Systems | |
|--------------------------------|----|
| Systems Providers for Airlines | 27 |
| System Providers for Sellers | 46 |

The majority of airlines (54 or 77%) have prepared and published API services conforming to a single schema version. Comparing adoption by schema versions highlights that airlines have developed capabilities across 8 out of the 9 published schema versions. Even within a single schema version, airlines are at differing levels of maturity in terms of depth and breadth of the business processes offered. So, while two airlines might expose shopping APIs that conform to the same schema version, say 17.2, from a consumer's perspective (aggregator, or seller) the APIs offered by each airline can be significantly different in the scope of the capabilities offered.

| NDC Schema Version | Airline Count | Single Version | Multiple Versions |
|--------------------|---------------|----------------|-------------------|
| 21.3 | 9 | 2 | 7 |
| 21.1 | 1 | 0 | 1 |
| 20.2 | 0 | 0 | - |
| 20.1 | 4 | 1 | 3 |
| 19.2 | 6 | 3 | 3 |
| 19.1 | 3 | 1 | 2 |
| 18.2 | 20 | 12 | 8 |
| 18.1 | 19 | 11 | 8 |
| 17.2 | 29 | 24 | 5 |

Airline Adoption by NDC Schema Version



16 airlines are supporting capabilities conforming to two or more schema versions, based on their ongoing and progressive investments in NDC and the maturity of the NDC adoption by sellers or intermediaries across the travel marketplace. Several have the same service or capability offer in compliance to multiple schema standards – adding to the complexity of their API real-estate and maintenance / support overhead.

| 1 Version | 2 Versions | 3 Versions | 4 Versions |
|-------------|-------------|------------|------------|
| 54 Airlines | 12 Airlines | 3 Airlines | 1 Airline |

NDC Booking Volumes

Industry participants have not yet disclosed definitive data sets that show or highlight NDC booking volumes to demonstrate a shift from traditional EDIFACT based distribution. Neither is what constitutes an NDC booking discreetly defined in the data we reference below.

ARC reported that in 2022, 7% of transactions that they processed were NDC based, with the majority through Direct Connect channels, with 1Q 2023 ahead of the same period last year. In an article from The Beat in August and in an Accelya press release in September, both report NDC volumes for July 2023 have reached 12.7% of airline transactions recorded through ARC's settlement gateways via ARC Direct Connect.

Accelya report seeing NDC volume growth (extent not disclosed) but not growing as fast as they would like or anticipate. Present volumes are significantly higher than 2019 volumes (+250%) but this was from a low baseline - and again, mainly via Direct Connect connectivity.

In early 2023, IATA were reporting that 10% of agency sales were NDC-based bookings. For 2022 Amadeus reported NDC bookings were a very small percentage of total bookings.

Direct Connect interfaces seem to remain the focus for several airlines, while others are pushing forward with their TMC / OTA / Agency partners to drive volume towards NDC pathways operationally and commercially, placing the technology burden into the travel seller marketplace, as noted in our prior White Papers referenced above.

PSS / CRS Technology Remains PNR Centric

While NDC based retailing provides the opportunity to drive change and enhanced retailing capabilities into the Indirect travel marketplace, with Offers being presented to buyers, to purchase an Order – currently every NDC purchase will end up as a Sell request within an airlines reservation system, and result in a traditional Booking / PNR being created, and were supported by the PSS / CRS system, associated

VCRs, e-tickets and EMDs. Back-end technologies currently remain based on legacy data structures. NDC based retailing or “Offer Management” is significantly ahead of technologies that can support “Order Management”. This is where adoption challenges exist within the travel marketplace, as airline PSS technologies recognize the PNR, and support traditional or legacy API calls to view, edit to change a booking, with EDIFACT based messaging protocols, yet the booking was created as an Offer and sold as an Order within the retailing stack.

Until airlines have fully embraced and have adopted Offer, Order, Settle and Deliver technologies to replace legacy PSS technology, the coexistence of Orders and PNRs / VCRs will remain a necessity. Significant effort remains on the part of airlines, their technology partners and travel sellers to significantly enhance the serviceability, management, and synchronization of Orders and Bookings / PNRs across the lifecycle of a booking. Orders and PNRs / VCRs may need to coexist for maybe up to 10 to 15 years while the industry is in a period of transition.

4.1. Summary of Issues and Challenges – an Airline Perspective

Despite NDC schemas being published and progressively enhanced to extend and grow the breadth of capabilities needed to drive modern airline retailing, adoption of these standards has been slow, and not very standardized at all in reality. Even across and within a single schema version, both airlines and industry technology partners have curated, developed, and packaged APIs, services and workflows to meet their own business needs and functions, thereby driving divergence and complexity and a lack of standardization.

Airlines have a wide breadth of options for the distribution of their products to the travel marketplace. Each pathway and / or embracing multiple pathways will drive complexity and cost to the airline, and based on the maturity, adoption and investment levels of technology partners / system providers and travel sellers, there are many struggles with the adoption of NDC based retailing and consumption of this content by sellers. The path to the revenue growth and cost benefits anticipated by NDC adoption is slow.

There is a transfer of responsibility and ownership of Offer generation, from the tech stacks provided by the GDS supporting EDIFACT based retailing, to the airline. Airlines are experiencing increased technology costs as a result as they progressively become exposed to the size, scale, and cost of supporting GDS shopping volumes as they shift towards NDC pathways. Depending on the type of connectivity pathways highlighted in section 3.2 above, latency has become an issue for some carriers, with reports of shopping requests taking 8 to 10 seconds or more for data to pass through the multiple hops it needs to progress from the travel sellers booking site to the airline retail stack and back again. We are also hearing about the emergence of caches and other semi-live replicas of priced availability that will permit a more rapid return of previously priced itineraries, offering speed and responsiveness at the expense of dynamic or personal-

ized offer creation.

4.2. Mitigation & Acceleration

DataArt envisions airlines and travel distributors will need to maintain a hybrid NDC and EDIFACT environment for the next 10 to 15 years as the industry evolves to a more NDC and Offer / Order centric distribution marketplace. It will take time and resources for airlines to replace legacy PNR based systems with Order based technologies and we shall see this emerging as a major focus for the industry for the years ahead.

So, from a distribution perspective, how can airlines invest, prioritize and progress investments in NDC based retailing to mitigate the challenges highlighted above, drive greater market adoption, and accelerate the realization of NDC benefits? Here are some of our thoughts:

- Given the scale, complexity, and ambition of an airline's NDC distribution strategy, airlines need to plan and invest wisely in the breadth and depth of their APIs supporting NDC retailing. Airlines need to voice their opinion and needs on the continued development of API standards and invest in their API platforms to drive as much flexibility and versatility to drive wide adoption of their NDC content.
- Work with travel distribution partners to understand their needs and challenges with NDC adoption, and to align on future industry and systems direction. Greater empathy, support, partnership & investment is needed to make retailing and servicing NDC content smooth and simpler for travel sellers. This will drive greater adoption.
- We see this in action in a recent T2RL First View article highlighting Virgin Atlantic's (VS) resumption of NDC distribution, where VS is declining to impose any penalties or surcharges on travel sellers that continue to use tradition EDIFACT links to its content via the GDS, while challenges persist regarding servicing of NDC bookings. To that end, they are setting up a dedicated helpdesk for servicing NDC booking. VS stated that they will not consider surcharges until servicing of bookings is fully automated. A notably different approach to other major network airlines in Europe.
- Develop a strategic roadmap for NDC to include technology needs, vendor / partner landscape, travel seller relationships and commercial strategy, and evaluate the breadth of the technical and systems transformation needed to support each phase and deliverable of your plan.
- Avoid being restrained behind the roadmaps and pace of development of your IT partners. Find a good network of technology partners who understand the NDC ecosys-

tem and can help speed up your NDC transformation.

- Adhere to open systems standards to enable technology partners to assist with NDC technology transformation.

4.3. DataArt – How Can We Help?

Technology partners like DataArt can help airlines drive NDC adoption and enhance technology platforms to address NDC related system challenges. Specifically, DataArt can help airlines:

Solutioning for scale – helping airlines architect, solution and optimize for NDC volumes hitting their retailing stack, to maximize responsiveness and mitigate risk of latency.

Evolve a cohesive API layer - development and management of an API layer, and supporting technology, orchestration that is flexible, and where possible, granular to enable the airline to work with industry actors, agnostic to downline processes.

Co-existence of orders and PNRs - developing interim orchestration layers for maintaining hybrid NDC and EDIFACT based technology platforms for post-booking servicing, codeshare and interline transaction processing, reporting, analytics, etc.

Enterprise data management – creating or augmenting an enterprise data strategy for retailing including instrumentation, insights and learning from all NDC channels.

Reducing friction with travel distributors – DataArt is an experienced partner to travel distributors, knowing their business processes and technology needs. DataArt can help airlines assess and optimize NDC processes and workflows that travel distributors can consume and work with key seller partners to help them consume.

5. Wrapping it Up

If you are new to your NDC journey, we hope that this White Paper gives you a strong baseline for understanding the complexity and challenges that you will encounter. In addition to the well documented issues and challenges facing travel sellers across the indirect distribution marketplace, airlines themselves face many obstacles when considering and executing their NDC strategy.


Significant investments in new technologies that augment, extend, or replace capabilities traditionally provided by PSS vendors and legacy EDIFACT GDS distributors will be needed, supported, and enabled by business process change. Airlines need to understand and assess the technology marketplace and think strategically about their go-to-market strategy and partnerships when it comes to indirect channel distribution strategy and enabling technologies for NDC.

Selecting the right partners, both in travel retailing and supporting and underlying technology investments is a critical part of executing your NDC strategy. At DataArt we are confident we have the insights, domain expertise and technical acumen to help airlines mitigate risk and accelerate growth and adoption of NDC based retailing.

If you are already into your NDC journey, we hope that we provided perspectives and information that you may not have considered.

In either case, we welcome your feedback and discussion on this ongoing topic.

6. About DataArt



DataArt is a global software engineering firm that takes a uniquely human approach to solving problems.

We integrate our engineering excellence with deeply human values that drive our business and our approach to relationships: curiosity, empathy, trust, honesty, and intuition. These qualities help us deliver high-value, high-quality solutions that our clients depend on and lifetime partnerships they believe in.

- +26 Years in business
- +100 / Travel-related projects
- +5,700 / Consultants and engineers
- 20% of our engineers have travel-related experience, and 60% of them are of Senior level

Please reach out to DataArt at travel.market.team@dataart.com or aviation@dataart.com

Or visit [our Aviation page](#)

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