

A spotlight on Total Offer Optimization

Fast forward to customer centric revenue management



You will find details on the author, methodology and references on page 19

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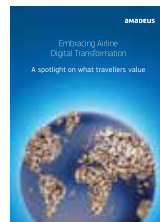
Foreword



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“Total Offer Optimization”. This represents Amadeus’ vision of constructing a personalized and customized multi-product offering for a customer at an optimal price for both the airline and customer. Rather than relying on static product bundles at pre-determined prices, we envision a system that develops a customized offer at the right price for each customer. To realize this vision, fundamental changes are necessary in the way we approach pricing, revenue management, and merchandizing. These systems must move beyond industry constraints and rigid data silos to become more flexible and utilize new technologies to be successful. **Airlines that embrace this evolution can realize substantial increases in revenue and competitive position.**



This paper is the second in the series *Embracing Airline Digital Transformation* where Amadeus shares its insight on the transformation of airlines for the digital world. In our first paper, *Embracing Airline Digital Transformation: A spotlight on what travellers value*, we introduced the concept of **Shape, Sell and Service**, highlighting areas where Amadeus can help

airlines optimize the end-to-end passenger experience. This paper dives deeper into “Shape”: the construction and optimization of customer offers. It overviews the evolution of revenue management in the age of personalization and merchandizing, and lays out Amadeus’ vision on what’s next.

We are convinced that **Amadeus is the right partner to help airlines shape their revenue management strategy and bring these solutions to market**, focusing on the total value of the customer to make Total Offer Optimization a reality in the near future.

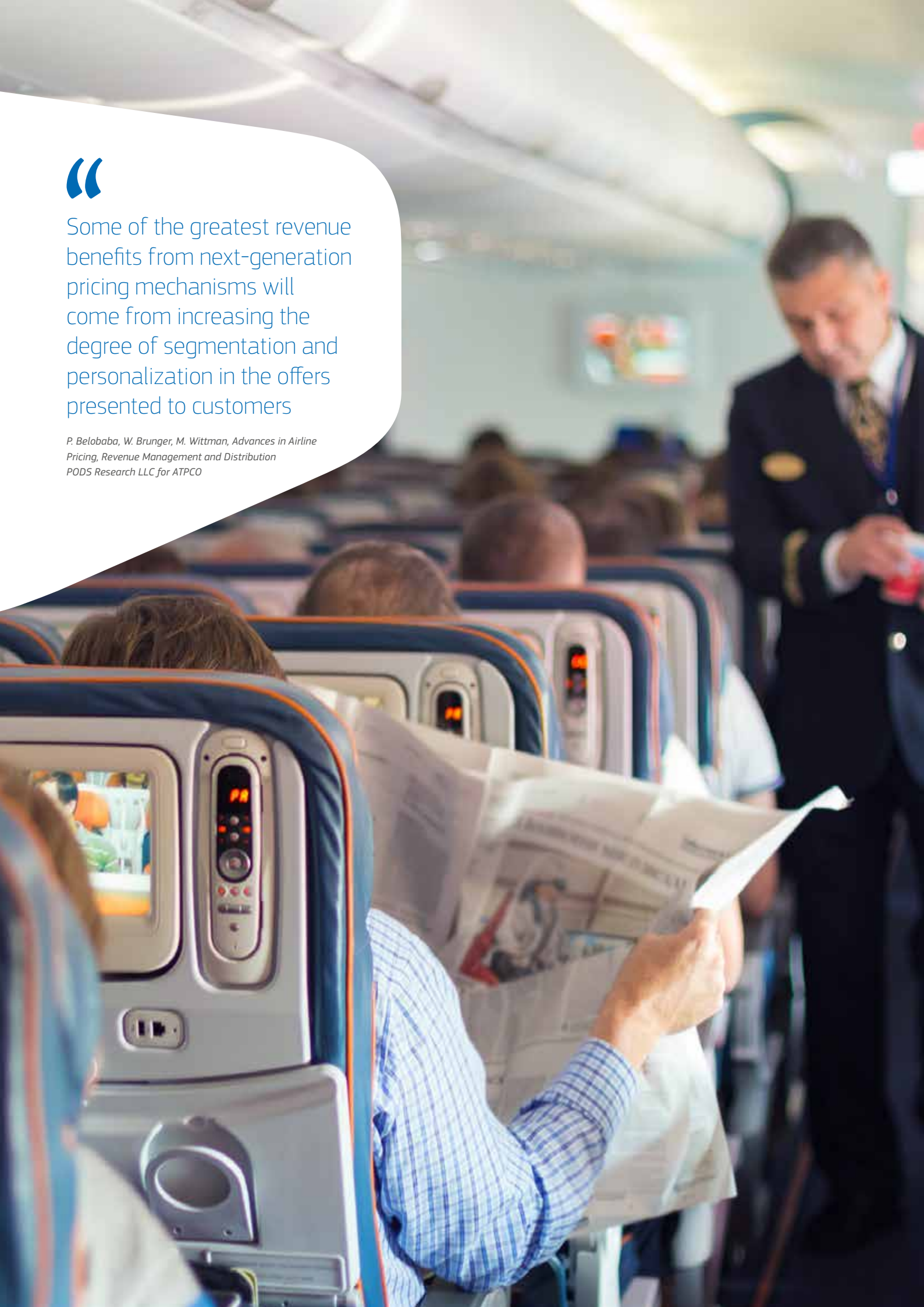
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Some of the greatest revenue benefits from next-generation pricing mechanisms will come from increasing the degree of segmentation and personalization in the offers presented to customers

*P. Belobaba, W. Brunger, M. Wittman, Advances in Airline Pricing, Revenue Management and Distribution
PODS Research LLC for ATPCO*



Executive summary

The airline industry is embarking on a major revolution, from just selling the customer a “seat” on a flight, to selling a set of customized products selected just for them. In many ways, the airline industry is learning from major online retailers such as Amazon on how to personalize the shopping experience, suggest paired products and optimize pricing. With this shift from seat to a personalized “bundle”, the way airlines approach pricing, personalization and revenue management has to change. Amadeus’ vision: Total Offer Optimization.

Total Offer Optimization embodies the shift from fixed fare classes and static fares to personalized product mixes and dynamically generated prices. Its goal is to offer the right mix of products at the right price to each customer individually. And to do it in a way that optimizes revenue for the airline, and optimizes the price and product offering for the customer.

With some airlines nearing 50% of their revenue from non-seat related sources, the role of traditional revenue management is changing and expanding. We are moving from static pricing to continuous, from class based availability to dynamic, and from seat optimization to total customer revenue optimization. Airline departments such as pricing, merchandizing, loyalty, revenue management, distribution and customer data management that have traditionally been relatively independent need to work together to jointly optimize the products sold to the customer.

Today’s shift to merchandizing and personalization is a great opportunity to improve the customer shopping experience, increase loyalty, and improve profitability.

Optimizing the product mix and price of offers has benefits for both the customer and the airline. For the airline this means improving conversion, yield, ancillary sales and profitability. What it does for the customer is reward loyalty, respond better to market conditions, and present better targeted offers that are more likely to be accepted.

To address the complexity of this new offer, new technologies and methodologies must be introduced. Changes in fare filing, shopping, distribution, and ticketing are predicted as the industry moves from rigid to flexible and from static to dynamic. To better forecast future demand, approaches such as customer choice modeling and machine learning are also fundamental to the new generation of revenue management systems. Of course, competition, market forces, and regulation are parameters that will have an influence on the new developments. These will determine the evolution of personalized offer creation and dynamic pricing.



Offer the right price to the right customer

Singapore Airlines

This may look like big challenges ahead; and they are. But the cost to airlines that do not address this change in our industry could be substantial. Airlines using personalized offers with dynamic pricing will gain market share and revenue at the expense of those without. **In an industry where most players have roughly equivalent revenue management technology, the first mover advantage will be significant.**

This paper will:



Look at the substantial changes coming in revenue management



Explore the creation of the offer



Consider the ramifications of moving to a total offer optimization approach



Introduce Amadeus’ vision of Total Offer Optimization

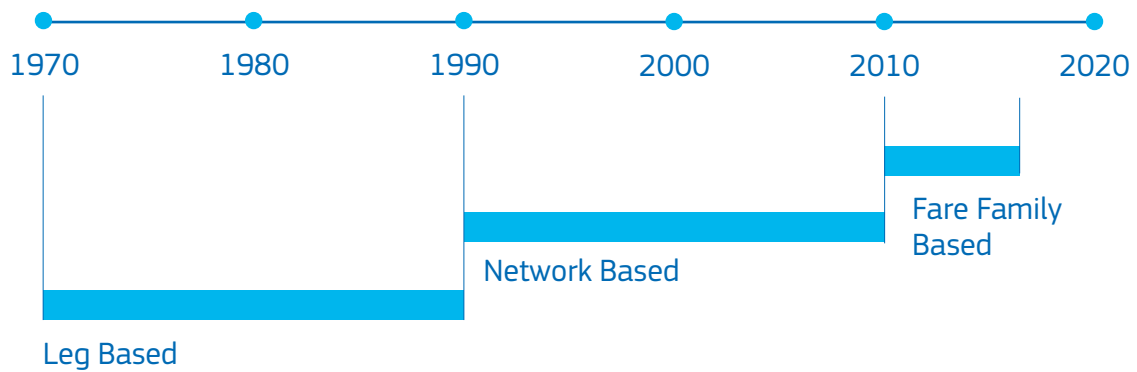


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The development of next-generation pricing and revenue management methods represents a transformational moment for the airline industry. These methods will allow airlines to break free from the many pre-Internet legacy systems and standards that have shaped and constrained current practices

*P. Belobaba, W. Brunger, M. Wittman, Advances in Airline Pricing, Revenue Management and Distribution
PODS Research LLC for ATPCO*

The evolution of revenue management systems



It is impressive to reflect that airline revenue management systems have been effectively used for 40 years. With its start in the 1970s with leg based systems, revenue management has evolved to model hub-and-spoke airline network models and to address the advent of fare families. It is a testament to the innovation possessed by our industry and its goal to optimally sell the perishable product that is an airline seat. Over the years revenue management has experienced constant innovation in techniques and technology. **With each innovation, revenue management became better at modeling the real world, and improved airline profitability.**

However, traditional revenue management systems were optimizing only one thing, the revenue collected per flight for the seat only. Looking at the fact that some airlines today realize 46% of their revenue from non-seat purchases is this still the best way to optimize revenue? Most likely not. **Revenue management systems will have to evolve to incorporate all the products that an airline sells and how they are bundled together.**

Most revenue management systems also have not incorporated the effect of loyalty and product personalization into their approaches. Traditional demand forecasting, based on fare class, breaks down when the airline product offered to customers can be individualized and personalized. Revenue management systems will need to look at new methods of forecasting demand and embracing personalization.



*Source: see p. 19

From seat centric to customer centric approach

Personalization has been used with great success at companies such as Amazon, Netflix and Pandora. Almost half of online retailers contacted by eMarketer have found that personalization increases revenue in excess of 10%. Unfortunately, personalization is also an area where the airline industry has been both leading and lagging behind. A leader with the launch of innovative loyalty programs in the 1980s, but behind in the effective use of personalization beyond that.



48% of US marketers reported that personalization on their websites or apps lifted revenues in excess of 10%

Personalization in Retail, eMarketer



So, how can modern personalization techniques help in the airline industry, beyond what loyalty and profiles have already delivered? Personalization can be used to power targeted offers for customers using data captured by the airline; with an offer being a combination of air and ancillary products proposed to the customer at a customized price. This offer can be generated and optimized using revenue management techniques coupled with data from the customer's own shopping and purchase history and with history from other customers.

What are you selling to your customer, and how?

The modern airline industry has been undergoing a fundamental shift in how it views its own product and how best to interact with its customers. Is the air travel product being sold to the customer a single unified offering, or is it a catalog of pieces that the customer can pick from?

Carriers such as EasyJet, Ryanair, Frontier and AirAsia have perfected a model where the air travel experience is broken down into multiple products that are purchased separately. The success of this model has caused larger carriers to adopt this concept to their own air travel product in the form of separate purchases for on-board meals, baggage, priority boarding and many other services. However, breaking the air travel product into multiple pieces is a challenge to many existing airline systems, and has required the addition of new systems and processes.

Most airlines have approached the sale of these "ancillary" products through the deployment of merchandizing catalog systems, which sit apart from the traditional airline pricing and revenue management systems. Sales of ancillaries traditionally take place after the customer has selected a fare, with little coordination between the two.



Ancillaries and 3rd-party content are not revenue optimized. Interaction between prices of seats and ancillaries is ignored

Thomas Fiig, Director Chief Scientist, Airlines R&D, Amadeus

With ancillary sales becoming a major part of airline revenue (and profitability) is this really the right approach? Revenue management systems should seek to integrate both bundled and forecasted future ancillary sales with the base fare.

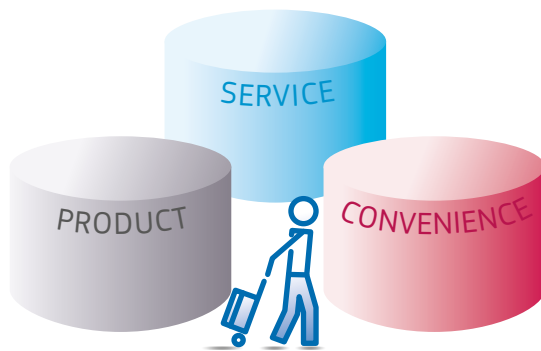
The time has come for airlines to evolve their approach and take into consideration the complete customer purchase to optimize its full value.

Optimizing the total value of the customer

The key challenge for the next generation of revenue management systems is to look at the total value of a customer. **It must consider multiple factors such as: base fare, ancillaries purchased now and in the future, purchasing context, cross-sell opportunities, loyalty and the value of travel on network partners.** With many of these factors contributing larger and larger portions of revenue, these must be effectively integrated into the concept of airline revenue management.

What brings value to the airline passenger?

Source: Embracing Airline Digital Transformation, see p. 19



Significant changes in the approach

Michael Wittman from the MIT International Center for Air Transportation presented the table below at a recent AGIFORS* Annual Symposium. It gives a strong summary of the changes that are necessary for the next generation of revenue management systems. Solutions must incorporate personalization and ancillary bundling. Dynamic pricing also holds a leading role in the next generation of revenue management, with pricing being customized for each customer in real time. This is a significant change from current approaches where fares are predefined months ahead.

We also see much more talk of “continuous”, “real-time”, “adaptive”, and “dynamic” in the next generation of revenue management systems. **Systems will evolve to be closer to the point of sale with strong real-time components.** Batch processes will be augmented with high speed personalization and dynamic pricing engines to provide the best solution to a particular customer. New technologies such as machine learning and big data techniques will be key to solving these increasing complex problems in real time.

* AGIFORS – Airline Group of the International Federation of Operational Research Societies

	Traditional RM	Next generation RM
 Pricing	Predefined static	Continuous
 Timing/Rules	Pre-set business rules	Real-time optimization
 Personalization	No personal info	Segmented individualized
 Competition	Own availability	Market adaptive
 Mechanism	Class-based availability	Dynamic fare generation
 Bundling	Airfare only	Ancillary bundling

Source: Customized Offers in Airline RM, M. Wittman, AGIFORS Annual Symposium

Decreasing complexity $\longleftrightarrow$ Increasing flexibility

Crafting the optimized offer

Next generation revenue management solutions will focus on the creation and pricing of offers

Today's revenue management systems focus mostly on one primary problem: the number of seats to make available in each fare class at a pre-determined fixed price. This model has been effective, but works well only within the rigid and discrete frameworks of ATPCO fare filings and fare class based availability. Add ancillary products, bundles, personalization, and a desire for additional price flexibility and the limits of the methodology is quickly reached. This is where the concept of the "Optimized Offer" becomes essential.

An offer you can't refuse

An optimized offer is a proposal to a customer to sell a product or group of products at a particular price that is optimized to maximize revenue for the airline and acceptability for the customer.

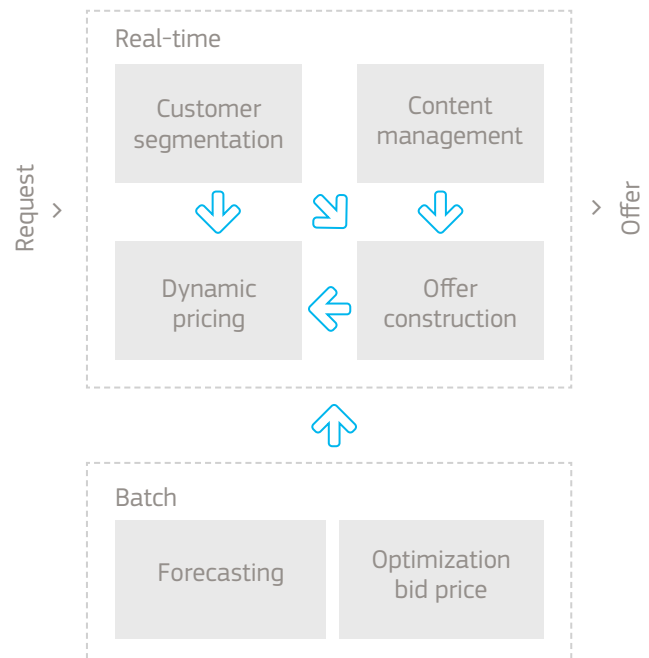
An offer can contain seats, ancillaries, differing fare rules, and even third party products. It also contains a price at which the group of products can be bought. In a simple scenario, this price could be a fixed price that is predefined (or even published). However, it is much more interesting and powerful if this price is dynamic and targeted exactly for the customer that requested it and when they requested it.

The optimized offer is an effective method of conveying revenue management solutions directly to consumers at a level of detail and accuracy previously unobtainable.

From batch solution to real-time offers

To truly support the generation of an optimized offer, we need to re-imagine the traditional revenue management and availability processes.

Future architecture of the offer optimizer



Source: *The Future of Airline Pricing*, T. Fiig, M. Gauchet, R. Le Guen, S. Lecourtois, AGIFORS Annual Symposium

The diagram illustrates the core architecture of how a real-time request processor transforms customer requests into corresponding offers. Customer and request information are analyzed to extract core personalization characteristics such as loyalty, channel, passenger mix, and preferences.

Centralized availability, merchandizing catalogs, static and dynamic product groups (bundles), forecasts, and optimization guidance are then used to construct a set of personalized offers for the customer.

The real-time request processor generates offers that are most likely to appeal to this particular customer. For example, business travelers may receive offers containing changeable fares with lounge access, while leisure customers receive basic fares and options with checked baggage. Finally, prices are assigned to each offer taking into account aspects such as customer loyalty, market conditions, analyst adjustments, and price optimization.

Next generation forecasting

In addition to the real-time systems, forecasting and optimization components are necessary to drive the offer construction and dynamic pricing systems. Next generation revenue management systems will incorporate advanced customer choice ranking / discrete choice models. This technique generates choice probabilities for each alternative flight or bundle that a customer might consider. Choice models require large sets of current, historical and competitive data, but yield results that are a natural fit with dynamic offers and pricing.

Shifting toward emerging technologies

When we look at the task of optimizing both prices and offer mixes in a networked environment, the number of potential combinations that the customer could buy is staggering. Customers may choose pure air products, or fares bundled with a variety of options. And of course the challenge increases further with optimization at the network level rather than leg based, crossing multiple airports and equipment types. The task quickly exceeds the capabilities of direct optimization techniques.

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Machine learning is a core, transformative way by which we're rethinking how we're doing everything. We are thoughtfully applying it across all our products, be it search, ads, YouTube, or Play. And we're in early days, but you will see us — in a systematic way — apply machine learning in all these areas

Sundar Pichai, Google CEO

Luckily, new advances and techniques in Artificial Intelligence and Machine Learning (AI/ML) have exploded over the past years. Companies such as Google, IBM, and Facebook have effectively implemented AI/ML to better predict weather conditions, optimize ad relevance, to understand human speech, and to power intelligent assistant systems. One common requirement necessary for successful AI/ML systems is massive amounts of historical behavioral data, which is something that our industry either possesses in abundance, or has the access to. This historical data driven through customer choice models can help form expected purchasing patterns modeled by AI/ML. We see a strong role for big data and AI/ML in optimizing offer product mix and dynamic prices.



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To fully achieve the huge revenue growth potential of Total Offer Optimization, you need people, processes and systems. With the right training for employees, innovative processes and robust infrastructure, airlines can successfully make the shift to customer focused revenue management

Vish A Viswanathan, Strategic Consulting, Airlines, Amadeus

Big challenges, big rewards

An airline that wishes to create optimized offers using personalization and dynamic prices has to face a number of challenges given the limitations of current industry solutions

Like all revenue management generations before it, this new evolution of revenue management will require systems and processes to be updated with the new captured data. It will also challenge how fares and availability are distributed and raise many new questions from airlines, such as:



Fare filing/Fare classes

- > Do we support traditional fares/classes and distribution methods alongside offers and dynamic prices?
- > Are dynamic fares filed with ATPCO?



Ticketing

- > What does a "ticket" look like in the future?
- > How are multiple products related together?
- > How is the combined "fare" stored?



Offer storage

- > Do we have to store every offer quoted to customers?
- > Can offers be reused?
- > How are offers attached to bookings/tickets?



Regulations

- > How will a personalized offer creation and dynamic pricing environment allow for fair competition and comparison?
- > What regulations will I have to take into account?



Shopping

- > Will there be a role for external shopping engines in the future?
- > How can an external engine match the personalization, product bundling and dynamic pricing that we use?



Infrastructure

- > Since we likely will have to generate the customized offers ourselves, do we possess the infrastructure/capabilities necessary to do this at scale?

There are certainly challenges to be faced but there are also many potential rewards for airlines, and their customers. IATA itself believes that a personalized and flexible shopping experience is required by our industry. Better matching products and prices to customers is a win-win for everyone involved, with higher profitability, better loyalty and customer satisfaction. So what will it truly take for airlines to benefit from this revenue management evolution?



10 home truths on optimized offers



1. Big data

Airlines will require large amounts of data to function, data which traditionally has not been part of revenue management such as shopping and conversion, customer behavior, and ancillary sales data. Big data techniques will be required to make effective use of these large data sets.



2. Augment the data

Airlines themselves may not have all the data in house necessary to power future revenue management systems. Capturing this data internally or in coordination with technology providers will be critical.



3. Move to real time

Many functions that are traditionally processed in batch mode may move to real time.



4. Consolidate the processes

Revenue management will bring processes and functions together across different airline departments.



5. Centralize core data

Key data such as inventory, schedule, customer choice models, business rules, customer information, and pricing needs to be kept in a central location available to all airline applications.



6. Shift to pricing control

Shift from allocation controls to pricing controls. Airlines may choose to continue offering all products to customers, but at increasing prices as availability is reduced.



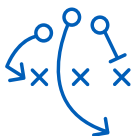
7. Reduce caching

Caching needs to be reduced or eliminated with the onset of dynamic pricing.



8. Support all channels

All distribution channels and touchpoints should support offers and dynamic prices.



9. Assess the impact

Many of the processes that have been traditionally outsourced to shopping engines, ATPCO, GDSs and third parties may become the responsibility of the airline or its technology partners.



10. Reap the rewards

This is the next major evolution of revenue management and will require the adjustment of many systems and business processes to be achieved. But like previous evolutions of revenue management, the rewards will be substantial.



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We can think of dynamic pricing as extracting revenue from the market by reducing the customer surplus. The gain is spread among airlines that utilize dynamic pricing, giving airlines an incentive to be a first mover

T. Fiig, O. Goyons, R. Adelving and B. Smith, Dynamic Pricing – The next revolution in RM? Journal of Revenue and Pricing Management

Shaping the future of Total Offer Optimization

Amadeus' vision of Total Offer Optimization embodies the industry's focus on the total value of the customer

As mentioned earlier, airlines have already embraced retailing and personalization, whilst revenue management systems lag behind. This is no longer sufficient. **The next step is now to create offers with the right mix of products at the right price to each customer individually.**

Total Offer Optimization is our vision to move from fixed fare classes and static fares to personalized product mixes and dynamically generated prices. It optimizes revenue for the airline, and optimizes the price and product offering for the customer. Everybody wins.

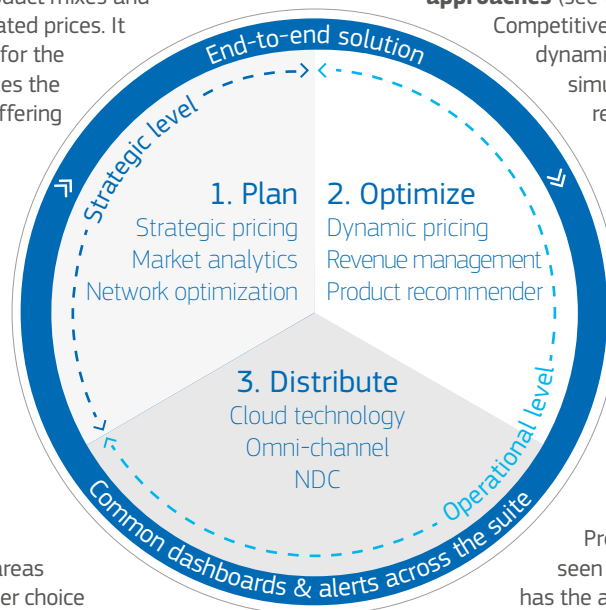
To realize its vision of Total Offer Optimization, Amadeus is leveraging its extensive suite of airline and distribution products and is developing new technologies and approaches in the areas of big data, customer choice modeling and machine learning. Amadeus' objective is to help airlines plan, build and distribute and optimize offers to their customers (see cycle diagram). **Building upon its extensive experience and innovation in revenue management, merchandizing, personalization, pricing, availability and shopping systems, Amadeus is in a unique position to bring revenue management to the next era.**

Gains from Total Offer Optimization?

So what can an airline expect to gain from applying Total Offer Optimization? In conjunction with PODS (Passenger Origin-Destination Simulator) Research LLC, Amadeus completed a simulation of the impact of dynamic pricing.

Although dynamic pricing is only part of the Total Offer Optimization solution, the results are very encouraging and will be enhanced further with the addition of the other parts of the total solution.

The results found that an airline using dynamic pricing could realize significant revenue gains of 6-7% versus traditional pricing and revenue management approaches (see the graph below).



Competitive airlines not using dynamic pricing in the simulation actually lost revenue as share shifted (case 1). In addition, if competitor airlines also deployed dynamic pricing, both airlines still realized increased revenue (case 2). Dynamic pricing is not a zero-sum game. **The only loser is the one that doesn't play!**

Previously, we have seen that personalization has the ability to increase revenue by upwards of 10% and dynamic pricing by 6%. Combined correctly, they have the ability to add substantially to an airline's bottom line, which is the ultimate goal of Amadeus' Total Offer Optimization.

Impact of Dynamic Pricing (DP) on revenue

Case 1:

Airline with DP **+6%** Competitor without DP **-1%**

Case 2:

Airline with DP **+3%** Competitor with DP **+3%**

Source: Dynamic Pricing – The next revolution in RM? Journal of Revenue and Pricing Management, T. Fiig, O. Goyons, R. Adelving and B. Smith

Conclusion

The goal of this paper has been to review our vision of the next generation of airline revenue management systems and to introduce Amadeus' vision of Total Offer Optimization

Substantial changes are taking place in the airline industry and in the way that the industry sees the products that it sells. Airlines are making considerable efforts to act more like retailers, offering multiple products, and attempting to personalize and customize the shopping experience for the customer.

As the product mix being sold by airlines becomes more complex with personalization and dynamic pricing, airline revenue management techniques must evolve. No longer is optimizing the revenue from a "seat" sufficient. Airline revenue management must be enhanced to optimize the total potential revenue from a customer as a whole.

To accomplish this the next generation of revenue management solutions will cross multiple airline silos bringing together pricing, availability, marketing, merchandizing and other disciplines. Data needs will be massive, and centralized non-cached information critical.

Revenue management solutions will evolve from opening and closing fare categories, to generating customized offers for customers. We will see a shift from allocation control to pricing control, where product mixes are always available, but prices change continually.

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The Airline IT infrastructure is still largely based on design principles from the 60s. The advances in Revenue Optimization since the 70s arrived gradually, and then were implemented to fit with the existing design. **We have started with a blank sheet to solve the Revenue Optimization challenge.** Our key goal is to remove most of the frictions in the current infrastructure that are limiting airlines from reaching their full revenue potential

Umit Cholak, Vice President, Revenue Optimization, Airlines Solutions, Amadeus

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By 2021, we will see the current era of rigid distribution replaced by what we call “Active Distribution.” Active Distribution will be focused, purposeful, and frictionless. Though passengers, travel agents, and travel managers will still have to follow certain processes, Active Distribution means they will enjoy richer, more flexible flight shopping experiences and receive more personalized results

The Future of Airline Distribution 2016-2021 IATA / Atmosphere Research Group

It is an exciting time for the airline industry. We are on the verge of another generational change in the way we approach airline revenue management. With Amadeus' Total Offer Optimization vision, we look forward to supporting airlines with more customer-centric revenue management practices.

Methodology

Amadeus commissioned William J. Niejadlik, a consultant for Travel Tech Consulting, to write this paper. William carried out interviews with Amadeus and airline customers, complemented by his extensive knowledge in the Airline Revenue Management landscape, as sources for the paper. This report is also supported by academic industry research on the topic of revenue management.

Author



Travel Tech Consulting, Inc. founded in 1995, is the recognized leader on how emerging technologies impact the global travel industry. Founded by Travel Tech Consulting President, Norm Rose, and based in the Silicon Valley, Travel Tech Consulting works with a global network of travel industry experts who join forces to meet the needs of specific client engagements. Travel Tech's consultants are experts in all sectors of the travel industry including airline reservations, revenue management & loyalty systems, online travel booking & wholesale technology, global distribution systems, travel agent point of sale & distribution platforms, tour operators & wholesale software, corporate booking, expense & business intelligence systems, hospitality property and central reservation technology and government authorization, booking & voucher automation. This includes deep knowledge of technologies used for reservations, distribution, and marketing. A particular focus is on emerging technologies such as mobile, social networking, artificial intelligence and blockchain.

William J. Niejadlik

William Niejadlik is a consultant for Travel Tech Consulting Inc. based in San Francisco, California. He consults with airlines, GDS, agencies and related businesses in the travel and transportation industry. Prior to consulting, William was the CTO / co-founder of vayama.com and the SVP of Emerging Technologies at BCD Travel. Before focusing on agency and distribution issues, William constructed airline, cargo and hotel revenue management systems, flight scheduling and operation control systems for major airlines and hotel chains. William holds a MS in Operations Research from Stanford University and was a researcher at the MIT Flight Transportation Laboratory.

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