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Improving Airline Revenues with Variable Opaque Products: “Blind Booking” at Germanwings

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Airlines often confront the challenge of determining how to profitably sell their distressed inventory (i.e., seats that their revenue management systems forecast will remain unsold). One solution to this problem is to sell this distressed inventory as opaque products via either the airline’s own channels or a third party. An extension of the opaque product is the variable opaque product (VOP), whereby the customer can vary the amount of opaqueness in one or more attributes. Germany’s leading low-cost airline, Germanwings, tested this concept during a period of more than three years with very encouraging results; the airline experienced a significant increase in revenues. Furthermore, competing airlines have not reacted to this new initiative; thus, it appears that Germanwings has generated a new set of customers. In this paper, we describe the significant results achieved by combining revenue management and marketing insights in the development of a VOP at Germanwings, present business metrics generated by the VOP, and offer insights on the use of VOPs in other industries.

Key words: variable opaque product; pricing; airline; revenue management; marketing; OR.

Jochen Schmidt lives in Cologne, has not taken a vacation for a while, and wants to take a weekend trip to an exotic European city next month. He has heard that Germanwings (www.germanwings.com), a large European low-cost carrier, has a product known as blind booking that might suit his requirements. On the airline’s website, he chooses “Metropolis Western Europe.” Although he considers the 13 destinations in this group to be generally desirable, the group includes some destinations that he does not want to visit. Therefore, he removes Berlin, Vienna, and Munich from his selection; to eliminate these destinations from the list, he pays a fee of 5€ (i.e., five euros) per city. Before he submits his payment, Schmidt does not know for which of the 10 remaining destinations in the group he will purchase a flight; however, he does know the dates on which he will be flying. Schmidt pays with his credit card and is then notified of his destination.

Blind booking is an example of a variable opaque product (VOP) that we propose as a new pricing practice for airlines. In this paper, we discuss the influence of VOPs on an airline by recounting the implementation of blind booking at Germanwings. Our purpose is to showcase the success and value of an innovative product application, which is complementary to the existing RM system and combines insights from RM and marketing (cf. Metters et al. 2008)—not to describe innovative revenue management (RM) algorithms. The blind booking VOP generates substantial revenues, which Germanwings has found to be predominantly incremental and noncannibalistic. We also discuss other industries in which VOPs can be used.

Revenue Challenge for Low-Cost Airlines

In full-service airlines (FSAs), RM is highly developed, and a large volume of literature has been devoted to the topic (e.g., Weatherford and Bodily 1992, Kimes 1994), whereas the study of RM as practiced by low-cost airlines (LCAs) is still in its infancy.

One of the main difficulties in developing an RM system for an LCA is that the products that LCAs
offer are generally free of restrictions (e.g., Saturday-night stay). Therefore, segmentation at LCAs is usually applied only through the time of booking and the choice of flight (Alderighi et al. 2004). Hence, RM at LCAs has relied on understanding customer willingness to pay as a function of the advance purchase (i.e., the amount of time before the flight is scheduled to depart) and the particular flight that is being purchased (Koenigsberg et al. 2008).

An RM system is the major decision support system in assisting airlines in managing the demand for their inventory (Smith et al. 1992, Talluri and van Ryzin 2004), however, airlines generally still have a significant amount of distressed inventory (Gallego et al. 2008), usually ranging from 20 percent to 30 percent of the total seat availability. FSAs commonly practice overbooking to minimize the amount of distressed inventory. Overbooking is a less optimal solution for LCAs, who generally have higher load factors and lower no-show rates than FSAs (Klophaus and Poelt 2007).

A popular way for LCAs to dispose of distressed inventory is by offering promotions, such as offering a limited number of seats for a low price, for example, €6 for a one-way flight on Ryanair (ryanair.com). The main challenge of such promotions is that these promotional prices may cannibalize regular-price tickets because customers see no disadvantage associated with buying a promotional ticket.

Opaque products are a relatively new way for airlines to sell distressed inventory without the cannibalization risks associated with the methods mentioned above. An opaque product is defined as a product for which one or more product attributes are not revealed to a buyer until after payment has been made (Fay and Xie 2008, Jiang 2007). The main challenge of such promotions is that these promotional prices may cannibalize regular-price tickets because customers see no disadvantage associated with buying a promotional ticket.

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Variable Opaque Products (VOPs)

VOPs differ from pure opaque products because VOPs enable customers to influence the level of opaqueness (Post 2010). For example, when customers use blind booking, they are uncertain of their travel destinations; however, they can decrease their level of opaqueness by deselecting a certain number of potential product characteristics (e.g., flight destinations). After the purchase of a variable (and pure) opaque product is complete, specific product characteristics are revealed. However, to prevent customers from simply discovering the product’s characteristics (e.g., by booking and then cancelling), VOPs and opaque products do not provide any refunds if the product is cancelled after booking (see Table 1).

VOPs can be used to target low-valuation consumers while limiting the risk of cannibalization from higher-valuation consumers. However, VOPs are less attractive than regular products to consumers because consumers are uncertain about the utility they can derive from the hidden product characteristics (Ng 2006, Xie and Shugan 2001). Thus, high-valuation consumers may be unwilling to accept this uncertainty. Furthermore, these products enable the company to sell these products at lower prices without exerting pressure on their posted prices for regular products because the opaqueness of the products limits price comparison. Giving customers influence over the specific level of opaqueness also differentiates the opaque product; thus, it decreases or increases the level of price transparency and segmentation potential. Hence, information diffusion among consumers regarding the likely product attributes is very limited (Hinz and Spann 2008).

VOPs complement existing RM in airlines because these products enable an airline to sell distressed
inventory—those seats that the RM system is unable or unwilling to sell.

**Germanwings Background**

Germanwings is Germany’s second-largest LCA after Air Berlin. The airline has 30 A319 aircraft with seating for 144 or 150 passengers, depending on the configuration. The airline was founded in 2002 and became a wholly owned subsidiary of Lufthansa, Germany’s largest FSA, in January 2009. Germanwings operates from its main hub in Cologne, Germany and also has smaller hubs in Stuttgart, Berlin-Schoenefeld, Hamburg, and Hanover.

Germanwings operates in the highly price-sensitive, low-cost segment of the German aviation market. Because of the difficult business environment in which Germanwings operates, pricing innovation is crucial to the company. This led to the implementation of blind booking.

**The Blind-Booking Variable Opaque Product**

A blind-booking offer at Germanwings is opaque with respect to the destination to which a customer will fly: A customer can select a flight origin (e.g., Cologne) and travel dates (e.g., leaving Cologne on August 15 and returning on August 19), but not the travel destination. Different sets of alternatives containing between 10 and 17 different destinations are available (see Figure 1). One-way prices range from 19.99€ to 49.99€. Figure 1 shows a set that includes the following possible flight destinations: Barcelona, Berlin, Budapest, Dublin, Edinburgh, Istanbul, Lisbon, London, Prague, Reykjavik, Sarajevo, and Vienna. Thus, this opaque product is variable with respect to the set of destinations a customer chooses.

This opaque product is additionally variable because a customer can exclude between 7 and 14 destinations from a set at a price of 5€ per round trip and per passenger (see Figure 2); these exclusions easily contribute a substantial portion to the final ticket price. The maximum number of exclusions is designed to ensure that at least three possible destinations remain in the set as a minimum level of uncertainty for customers. The actual destination is revealed to customers immediately after the purchase is complete, and blind booking tickets are nonrefundable and nontransferable. This major uncertainty regarding the actual destination substantially limits the risk of cannibalizing regular-price ticket sales. This logic is identical to the logic associated with using opaque products in general (Anderson 2009).

**Implementation**

In this section, we discuss the technical implications, the core-pricing logic, and the implementation of the blind-booking process.

**Technical Implementation**

The blind-booking tool was implemented as an application service provider (ASP) solution to ensure that the tool caused a minimal amount of disruption to other Germanwings system processes during its implementation. This hosted solution is also designed to limit any effect on Germanwings when problems with blind booking cause the service to be offline.
The link to blind booking was integrated into the Germanwings website, which is the airline’s major distribution channel (75 percent of the airline’s sales result from direct customer purchases via its website).

The ASP model (see Figure 3) is advantageous because if the third-party (SigmaZen) server is offline for any reason, the airline’s existing processes are unaffected: a customer who clicks on the VOP link on the airline website will receive an error message. Because the pricing and booking modules can still function with relatively nonsensitive or coded airline data, the danger of compromising airline key performance indicators is minimized. For an airline, this ASP approach is preferable to having the entire system on the airline side of the information technology firewall, where it is more difficult to manage and update.

Pricing Logic
Germanwings management believed that the pricing structure should be simple for consumers to understand. Therefore, we gave priority to a pricing structure that would be perceived as fair to the consumer. The core-pricing logic of blind booking is: (1) the price for a blind-booking ticket with the lowest level of opaqueness should be below (but close to) the price of the regular flight; (2) the price for a blind-booking ticket with the highest level of opaqueness should be close to the marginal cost of transporting the customer; (3) within these limits, the price should increase as opaqueness is reduced.

To reduce the risk of cannibalization of its existing market, the management team determined a minimum uncertainty limit. This minimum level of uncertainty or opaqueness is necessary because a blind-booking customer must have a certain level of flexibility in his (her) requirements to be offered a price. The logic behind this necessity is that blind booking would not be attractive to customers who are not highly flexible.
Exclusion of destinations

You have the option to exclude 10 destination(s) from the Blind Booking for 2.50 EUR per direction and passenger. Check the destinations you want to exclude below.

I want to exclude the following destinations:

- Barcelona
- Lisbon
- Milan
- Rome
- [ ] Zurich

- [ ] Berlin Surcharge € 5.00
- [ ] Munich Surcharge € 5.00
- [ ] Vienna Surcharge € 5.00
- [ ] Dublin
- [ ] London
- [ ] Marseille
- [ ] Reykjavik

Price information

Round trip: 1 adult/s at € 39.98

- Exclusion fee: Berlin € 5.00
- Exclusion fee: Munich € 5.00
- Exclusion fee: Vienna € 5.00
- Exclusion fee: Zurich € 5.00

Total Price € 59.98

Figure 2: The figure shows an example of blind booking destination exclusions at Germanwings.

Figure 3: The flowchart shows an application service provider model for VOPs.

We used a simple linear pricing structure: for each deselected destination (which decreases the size of the original pool of destinations), the price rises by a specific flat fee. Originally, this fee was €8; however, sales and the conversion rates (i.e., how many visitors to the blind-booking website booked tickets) were low. During this initial stage, the airline management was very wary about the cannibalization effect of blind booking, and the minimum flexibility requirement dictated that customers were restricted to deselecting a maximum of two destinations. This restriction normally produced 8 to 15 remaining possible destinations depending on the pool selected.

To improve sales volume, the Germanwings RM team reduced the deselection fee to €5 and allowed...
customers to deselect as many destinations as they desired; the only restriction was that at least three destinations must remain in the pool. The base price of €39.98 for a return flight remained unchanged. These changes had an immediate and positive effect on the sales volume and the conversion rate, which increased by a factor of five, and on revenues, which more than doubled. The higher volumes and the deselection of more destinations (which generated additional revenue) more than compensated for the revenue-decreasing effect of reducing the fee. Since we implemented these changes, we have made no other pricing changes.

**Booking Process**

Blind booking is a virtual product for which a customer necessarily accepts a range of possible flight destinations; therefore, Germanwings is able to place the customer on the flight that is most suitable for the airline.

Like most airlines, Germanwings has an RM system that determines the level of availability that is set aside for each fare class on each flight. The forecasting module of the RM system provides predicted load-factor data for each possible flight alternative to the blind-booking algorithm. Although the Germanwings demand forecast provides useful information, analysts are required to adjust the forecasts to account for unforeseen events and market trends (e.g., by manually adjusting the forecast).

Germanwings assumes that the forecasting module, including the analyst interventions, provides an accurate forecast of the true number of passengers at the departure time of each flight. Currently, blind booking uses this forecast information to determine a weighting factor for each potential flight; this factor is then entered into a random number generator that determines the flight to which the blind-booking passenger is assigned.

Ensuring that a blind-booking passenger, who generally receives a substantially cheaper fare than a regular passenger, does not prevent last-minute and significantly higher-paying passengers from purchasing a ticket on the same flight is important. Therefore, flights that are forecast to be full or nearly full are unavailable for blind booking.

We weight the flights that are suitable based on their forecasted number of empty seats; an algorithm randomly selects the booking destination from these available flights. We chose this semirandom selection of flights to ensure that the system is less predictable for savvy consumers (i.e., consumers who try to determine in advance the flight to which they will be assigned).

After the destination has been selected, a booking message is sent to the Germanwings booking engine to book the outbound and inbound flights chosen by the algorithm. Once the bookings are complete, an e-mail explaining the flight bookings is sent to the customer. This notification generally occurs within a few minutes after the customer has completed payment on the Germanwings website.

Using this method, Germanwings has been able to allocate blind-booking purchasers to flights without preventing later full-fare paying passengers from flying on the same flight. In the very seldom situation in which a blind-booking customer deselects many destinations and those destinations that remain are all blacked out, the blind-booking system returns an error message explaining that the booking is not possible.

Figure 4 depicts the blind-booking process at Germanwings. A customer can access the offer overview screen via the airline website, which has a link to this screen, or via a URL that directly links to this screen. This screen shows the various offers, as the example in Figure 1 illustrates. A customer selects an offer, activates the link next to the offer by pressing the small arrow below the destination list, and is taken to the offer details screen. At the offer details screen, the customer enters additional information, such as group composition, dates for the outbound and return flights, and the destinations to be excluded (see Figure 2). After this information has been entered, the availability forecast database is consulted to verify that the required minimum number of flights is available on the dates selected and that each flight has sufficient excess seating capacity. Germanwings does not fly to all destinations daily; thus, at this stage, the system must verify that at least two possible flight opportunities are available. If insufficient flights are available, an error message is generated and presented to the customer. Otherwise, the customer transitions to the passenger data and payment screen. On this screen, the customer enters passenger names, dates
of birth, invoice address and contact details (including e-mail address), and payment details. The customer is then presented with a booking review screen showing all the details applicable to the transaction. The customer reviews the details and, when satisfied, clicks a link to complete the passenger side of the transaction. The booking request is made based on the flight determined by the weighted random flight selector, as described above. If the airline booking engine is able to complete the transaction, the customer is presented with a booking confirmation screen, and a booking confirmation e-mail is sent to the e-mail address entered as part of the customer’s contact information (see Figure 4, Step 3).

**Results**

Blind booking generated a 1.2 percent volume contribution and contributed 4.2 percent of the total Germanwings profits in 2009. The 2009 Lufthansa Annual Report revealed that Germanwings’ revenue...
was €580 m and its operating profit was €24 m by carrying 7.1 million passengers in 2009 (Lufthansa Group 2009). Revenues from blind booking were 25 percent higher in 2010 than in 2009. Because 2010 was a difficult year for Germanwings, the percentage of influence associated with blind booking was higher. Germanwings’ 2010 revenues were €630 million, of which blind booking contributed 4.7 percent. This product offering attracts new customers without cannibalizing existing customers, and its popularity is growing. Because of all of these factors, the parent company considers this product a massive marketing and financial success. Oliver Scheid, head of revenue management at Germanwings, endorses blind booking and has stated that “for Germanwings Blind Booking is a very successful tool to fill off-peak-load gaps. Because seasonal demand weakness is a major challenge for low-cost airlines, we are able to push short-term load factors up to 1.5 percentage points without cannibalizing high yield demand.”

The Germanwings management team considers blind-booking sales to be (almost) exclusively incremental and noncannibalistic. The contribution from these sales represents almost 100 percent additional profit. This significant contribution is plausible given the major uncertainty related to the product: before booking a flight, a customer is not aware of the destination to which he or she will actually fly. Thus, any customer who wants to fly to a specific destination (e.g., for business reasons) cannot use a blind-booking ticket; even when the maximum number of possible destinations are excluded, at least three possible destinations always remain. We must admit that we do not have the data to test this noncannibalistic tendency; however, we concur with Germanwings management that blind-booking sales are incremental. Based on an application of opaque products at an Australasian airline in which the destination was known, but the departure and return times and (or) dates were not, we see that such products are popular with consumers and that cannibalization is low (Mang et al. 2008).

During the three years since Germanwings launched blind booking, there have been no adverse competitor reactions to the product; the competing airlines do not seem to view this product as an attempt to poach their existing passengers. Since Germanwings introduced blind bookings in late 2007, bookings have steadily increased when we account for seasonal differences. This increase is remarkable given that the VOP is presented as a small button on the Germanwings website; furthermore, other than being featured in the Germanwings newsletter in December 2007, the product has received no promotional exposure. These factors indicate that satisfied customers are recommending the service to others; indeed, blind booking has frequently been mentioned in various online forums. In addition, among the customers who have previously purchased a blind-booking ticket, more than 10 percent of these customers use the product again: one customer has purchased blind-booking tickets 28 times during a two-year period.

In 2009, customers excluded an average of 1.85 destinations—26 percent excluded no destinations, 20 percent excluded one destination, 22 percent excluded two destinations, 14 percent excluded three destinations, and 18 percent excluded four or more destinations. Revenues gained because of the exclusion of destinations (€5 per passenger and round trip) equaled 18 percent of the total revenues from blind booking (versus 16 percent in 2008). We note that 25 percent of customers deselect destinations that are not actually available on the days requested. Therefore, they pay a fee to deselect a destination to which they would never have been assigned.

Destinations vary in their attractiveness. For example, the cities of Berlin, Leipzig, Dresden, and Vienna are deselected much more often than, for example, Barcelona or Madrid. This suggests the potential to apply differential pricing to the deselection of specific destinations. However, for strategic marketing considerations, Germanwings is content with retaining the current linear pricing curve.

Transferability to Other Industries
The industries that can benefit most from a method that allows companies to sell excess capacity without cannibalizing existing revenues are mainly those at risk for losing the most money if (1) their products are not sold, or (2) are sold later after the company has experienced high costs in storing the unsold products. The method we describe in this paper is
particularly applicable to industries with highly perishable products, such as airlines, freight and cruise companies, holiday resorts, hotels, and TV and print media selling advertising slots. Most of these industries already experiment with opaque products, for example, in Internet advertising or air cargo (Gallego and Phillips 2004).

VOPs can be a straightforward extension for these industries, in which customers may influence the opaqueness of the products on various dimensions. For example, a television network may offer a VOP consisting of a 30-second spot with the maximum level of opaqueness, ensuring airtime at any time on any of the “networks” stations within, for example, the next seven days. Customers may reduce opaqueness on different dimensions, for example, by deselecting specific stations (e.g., the History channel), time slots (e.g., the morning), or days of the week (e.g., Monday). However, a VOP requires that a minimum level of uncertainty remains for each dimension.

In the medical industry, VOPs might be applicable to high-value medical services (e.g., hip replacements and certain cosmetic surgeries); such VOPs could be uncertain with respect to the exact timing and location (in the case of a hospital chain) of the treatment. In the entertainment industry, shows, cinemas, sporting events, and restaurants can benefit from VOPs, particularly if the marginal cost of servicing an extra customer is low. VOPs perhaps could also apply to durables such as cars and boats, particularly during recessions. A car manufacturer might hold a large inventory of finished cars of different colors and specific features (e.g., manual or automatic transmission). A related VOP may entail uncertainty with respect to colors and specific features, and the customer might be given the option of deselecting specific colors.

VOP has been a practical solution to the problem of determining how to sell excess capacity without cannibalizing existing sales.

Blind booking is a VOP in one dimension: the only uncertainty is with respect to the flight destination. A related approach is to create VOPs on the dimension of temporal uncertainty with respect to the exact flight dates within a time window selected by the customer. Furthermore, the exact product characteristics need not be revealed immediately after purchase; these characteristics can be revealed at any time after the purchase has been completed. This option might be worth exploring. This period (and the remaining prior notice period before the actual flight date) is another dimension of opaqueness that customers might vary (Petrick et al. 2009).

Although blind booking has the potential for refinement, strategic marketing considerations and the desire to ensure that the product remains simple and easily understood by customers have prevented more sophisticated additions to date. However, the operations research opportunities of VOPs are immense. Exploring how VOPs are priced and determining how they are allocated are two fertile areas for future research. Furthermore, the specification of the minimum uncertainty requirement (i.e., at least three possible destinations for blind booking), which can be regarded as the base restriction of the VOP to limit cannibalization of the existing market, is still determined at the discretion of management. Determining the optimal setting and design for this minimum uncertainty requirement would also be an interesting topic for future research.

Summary
A VOP is an opaque product with an additional feature: the customer can vary the opaqueness and thus control the uncertainty of the product that will eventually be consumed. A blind-booking VOP has been operating successfully at a European low-cost airline, Germanwings, for more than three years. The VOP has generated substantial incremental revenues and has high customer satisfaction. In this regard, this

References


Oliver Scheid, Head of Revenue Management, Germanwings GmbH, writes: “Germanwings GmbH is the largest low-cost airline in Germany with thirty A319 aircraft and 7.1 million passengers transported in 2009.

“In November 2007 Germanwings implemented the Blind Booking product developed and supplied by SigmaZen GmbH.

“Germanwings believes that Blind Booking is well-aligned with the customer-centric approach strived for by the airline. Furthermore, Germanwings regards Blind Booking as an innovative marketing initiative that sets the airline apart from its low-cost competition.

“Germanwings views consumers who are prepared to pay in advance to fly to a group of three or more unknown destinations as incremental business and that revenues from such customers are predominantly incremental. Although this belief is anecdotal, of the 52,255 bookings made over Blind Booking from its initial launch to the end of August 2010, only 915 bookings (1.75%) had only three destinations to which the customer was prepared to fly and over 84% of all bookings had seven or more possible destinations. Based on these figures Germanwings believes that revenue dilution from the Blind Booking offering is minimal.

“There have been a total of 233,690 seats sold with Blind Booking since it was launched and during the summer season demand for Blind Booking has been particularly strong. In August 2010, Germanwings sold a total of 850,000 seats including those seats sold over Blind Booking. Over the same month Blind Booking sold 18,600 seats or 2.2% of total volumes.

“The average seat price for a Blind Booking is less than the normal Germanwings air fare but it is still significantly higher than the marginal cost of transporting a passenger; therefore the contribution of Blind Booking to Germanwings profits has been significant.

“Technically the Blind Booking system has been extremely reliable and has required very little input from Germanwings to maintain its operation.”