



# Advanced analytics in hospitality: Driving innovation, delighting customers, and capturing value

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Digital technologies are creating value and rearranging roles in the travel industry. Here's how industry leaders are profiting from the change.

**Over the past 20 years**, advances in digital technologies have driven numerous innovations and disruptions in the travel industry. These technologies and the companies that offer them have rearranged the industry, leaving some players behind—travel agents, for example—while introducing more complexity into the value chain between travelers and destinations.

More recently, mobile technologies have taken center stage as consumer behavior shifts with astonishing speed toward researching and booking travel through smartphones. Since October 2015, US consumers who book travel online have consistently spent more time engaging with travel content on their mobile devices than on their desktops, according to an Expedia Media Solutions/comScore study.

## **Creating opportunity from data: how the hospitality sector can use artificial intelligence**

Digital technologies produce a tremendous amount of data for travel companies. For example, Aviation Week recently reported that Pratt & Whitney's geared turbo-fan engine contains 5,000 sensors that collectively generate up to 10 gigabytes of data per second. This means a single engine could produce more than 400 terabytes of data during one 12-hour flight, and the aerospace industry alone might soon generate more data than the entire consumer Internet.

Many travel companies are still in the early stages of developing the advanced analytics capabilities necessary to capture the full potential of this data. One of the biggest opportunities under the analytics umbrella is artificial intelligence (AI), which carries important potential benefits for every sector of the travel and transportation industry.

As rapid progress continues in AI-enabling technologies like machine learning, natural language processing, and video recognition, we expect that artificial intelligence capabilities will soon reach the point where many travel companies are able to generate significant value by applying artificial intelligence at scale to their day-to-day operations. Some hospitality companies have already begun to deploy artificial intelligence in pilot projects. This experimentation and rapid prototyping are likely to continue as new techniques and technologies mature.

While it is still unclear how AI-related technologies and advanced analytics will change the hospitality sector, a number of distinct opportunities are starting to emerge:

### **Radical personalization through predictive analytics**

Predictive analytics is the science of taking a wealth of data and applying a combination of algorithms and machine learning to make predictions about which future outcomes are most likely. Many technology companies are already adept at predicting the next product a consumer wants to buy and then serving up a recommendation. For instance, Amazon's recommendation engine is estimated to generate more than one-third of its consumer purchases by using artificial intelligence to identify, rank and serve up the most appropriate product recommendations.

Over the last few years, hospitality companies have begun to deploy predictive analytics to better anticipate and meet customer needs and preferences. For example, in 2013-14, the US economy-hotel chain Red Roof Inn used public weather and flight data to predict which customers would face flight cancellations. Based on the results of this predictive analysis, Red Roof Inn launched a targeted marketing campaign aimed at mobile-device users in the areas most likely to be affected by harsh weather. In those areas where the strategy was deployed, Red Roof Inn saw a significant increase in business.

Similarly, the Hawaii Tourism Authority ran a “Discover Your Aloha” campaign that used facial recognition software to analyze travelers’ expressions via webcams as they viewed a video. The campaign then applied predictive analytics to generate a custom offer along with a booking link.

With advances in artificial intelligence and predictive analytics, hospitality companies will be able to create unique offers and experiences in real time (and at scale) that appeal to the needs and desires of each individual traveler.

### **Customized on-property product recommendations**

In hospitality, companies are beginning to link predictive analytics with geolocation data to deliver effective recommendations on property and in real time through mobile apps. For instance, one hotel company is piloting a program to drive ancillary revenues through the use of next-product-to-buy algorithms. These algorithms can analyze historical data to determine, for example, that a customer enjoys an early-morning coffee and is likely traveling with a spouse, and then use that customer’s cell phone location data to deliver a buy-one-get-one-free offer just as the customer walks by the hotel coffee shop in the morning.

On-property uses for analytics and artificial intelligence go beyond promotions and coupons. Consider the opportunity to dispatch a pre-ordered room-service dinner as the guest enters the lobby, or alert housekeeping that a room is available for cleaning as soon as a guest has departed. Over time, leaders in the sector could use geolocation data to deliver more sophisticated offers and services in all areas of the on-property experience and enable more efficient service operations.

### **Enhanced customer service through natural-language processing**

Several companies across the hospitality value chain from intermediaries to global brands to individual properties are exploring opportunities to streamline service throughout the customer journey by introducing chatbots—messaging platforms powered by AI or AI-plus-humans. For example, metasearch site Hipmunk’s Hello Hipmunk can identify upcoming travel plans and proactively suggest transport and lodging options for those dates.

As natural language processing technology continues to improve, chatbots will get better at conversing with users and handling all the steps in the travel journey from research to booking to stay. Chatbots with artificial intelligence capabilities should be able to learn a user’s travel preferences based on past bookings, reviews, even social media activity, then use this data to extrapolate and make valuable suggestions on destinations, lodging options, restaurants, events, and anything else that might hold special appeal for the user. For example, Kayak has launched chatbot functionality on several platforms, including a voice bot on Alexa for travel research and booking.

Ultimately, these platforms may help unlock one of the holy grails of hotel ancillaries: playing (and monetizing) a larger role in the customer's experience off property. Imagine asking a hotel's AI-powered concierge, "What's going on nearby?" and receiving a concert recommendation with the ability to book and receive tickets within the platform, all with a few simple voice commands.

### **Extending the travel experience through virtual assistants that connect guests to the Internet of Things**

Hospitality companies are beginning to equip rooms with voice-activated devices that are connected to the Internet. In December 2016, Wynn Las Vegas announced it would be equipping nearly 5,000 hotel rooms with Amazon's Echo speaker to give guests the ability to control their hotel-room features via the Alexa virtual assistant.

Similarly, Bloomberg reported this year that Marriott is testing both Alexa and Siri at its Aloft hotel in Boston's seaport district to see which virtual assistant will do a better job at letting guests control smart room functions via voice command.

Like chatbots, virtual assistants are starting to emerge as a travel booking platform in their own right. As millions of consumers adopt these devices and become comfortable conversing with virtual assistants in their homes and on the road, companies are developing a range of travel apps for these platforms.

We believe these virtual-assistant platforms will challenge companies and consumers to think differently about travel booking. Curated relevant results powered by AI will be critical to success. While a desktop search can return hundreds of properties for a weeknight in New York City, the results of a voice search, to be of any value, must be radically simpler, personalized, and ranked.

### **Robotics can deliver services**

In the near term, hospitality businesses are focused on how best to digitize the customer journey. In practice, that means reengineering steps such as the inefficient check-in and check-out experience, room-key access, or room-service ordering to make them immediately available via a smartphone.

Several global hotel brands, however, are already testing the ability of robots to perform check-in, concierge, and room-service tasks. Ultimately, AI-enabled robots could tackle many on-property functions. So far, only a few properties, such as the Henn-na Hotel in Japan, have attempted to deploy robots (including a robotic dinosaur receptionist!), but we would expect to see increasing experimentation with robotics and automation over time.

On a recent trip to the San Francisco Bay Area, one of our colleagues stayed at a Hampton Inn where basic room service tasks, including deliveries of food, drinks, and toiletries, were handled

competently by a wheeled robot from a company called Savioke. The robot used LIDAR to avoid obstacles as it rolled down hallways, rode elevators by itself, and recharged in the lobby when not in use. Our colleague reports that guests were calling down and requesting toiletries even if they did not actually need the item just for the novelty of receiving robotic room service.

While some guests may balk at service robots, others will welcome these encounters in hotels as long as the robots prove friendly, safe, and capable.

### **Smarter pricing management through machine learning**

Revenue management was the first major function to deploy advanced analytics at scale in the travel sector, with practices like dynamic pricing now an industry standard. We expect that advances in machine learning will improve hotels' ability to optimize pricing through more accurate analyses and predictions based on market demand signals, local room availability, and a deep understanding of the individual customer's willingness to pay. This trend toward personalized pricing can feel jarring at first, but it is rapidly gaining prominence in the retail sector with brick-and-mortar retailers and supermarkets attempting to replicate the flexibility of retail e-commerce giants who can instantly serve up a tailored set of products with personalized pricing to match.

At the same time, advances in predictive analytics will drive improvements in forecasting. Right now, companies throughout the value chain, from global hotel brands to technology start-ups, are using self-learning algorithms that incorporate historical data on millions of searches to predict future price movements based on multiple factors, including seasonal trends, demand growth, and limited-time special offers, as well as consumer preferences and purchase patterns. As demand forecasts become more accurate, pricing and yield strategies can become more sophisticated to capture greater value.

We already see many experiments around predictive price and yield, such as travel websites offering a view on whether an airfare will go up or down, and guidance on when to book. As artificial intelligence increasingly powers these predictions, we would expect to see a new wave of pricing and revenue-management strategies come into play.

Major advances in natural language processing, facial recognition, video analytics, and machine learning will continue to open many new opportunities.

### **How to get started: identify promising use cases, create the data lake, launch early prototypes**

Although some of these opportunities outlined above may feel futuristic, we believe they have the potential to create substantial value for hospitality companies and travelers alike in the near term.

For hospitality executives, the challenge is figuring out which advanced analytics and AI opportunities to prioritize, given the rapid pace of technological change. Here are five ideas on how to get started:

1. **Start with the sources of value.** Institutions often end up doing bits and pieces of analytics, which results in fragmented efforts, minimal business impact, limited cultural change, and often a negative view of analytics. Instead, we recommend starting by identifying a business problem you need to solve and then selecting a list of multiple complementary use cases that over time will build on each other to help drive business impact.
2. **Build your data lake.** A recent EyeforTravel survey revealed that nearly half of data professionals working in the travel sector are wrestling with data quality and cleanliness problems. Many hospitality organizations have evolved in such a way that they still operate with disparate, incompatible legacy systems. Pooling relevant data into a data lake can provide the infrastructure to rapidly explore analytics opportunities without many of the typical constraints of an IT systems project.
3. **Develop rapid prototypes.** Once you have built the data lake, the next step is to take two or three of the most promising use cases and build rapid prototypes to demonstrate their benefits. To succeed, these prototype projects should involve data scientists and translators—business experts who can incorporate business insights into the advanced analytics development process.
4. **Find compelling partners for your journey.** External partnerships offer the ability to test analytics concepts without investing massive time or resources in R&D. There are many ecosystem players developing platforms that hospitality companies could build onto, from smartphones to digital assistants and from cloud computing networks to machine-learning powerhouses. Given the scarcity of data scientists, it makes sense to form multiple partnerships, although you need to be careful about structuring these partnerships in a way that protects your IP and customer data. Careful use of partnerships can enable the rapid experimentation that's necessary to determine the best uses of advanced analytics and artificial intelligence for your business strategy.
5. **Institutionalize advanced analytics and AI.** To generate ROI and have a significant business impact, the insights from your AI models and prototypes must be integrated into existing workflows, processes, and decision making. Successful small-scale experiments can build organizational support and momentum by showing the value of analytics to an organization that may have its doubts. Once a pilot project shows value, the team can switch to scaling up and institutionalizing the approach, investing resources to build the organizational and governance capabilities to reap the full benefits of these technologies.

Where leading hospitality companies have committed to harnessing the power of advanced analytics, we see substantial opportunity for improving the guest experience, driving operational efficiency and optimizing pricing and commercial decisions to capture a sustained competitive advantage. The real story is the massive opportunity waiting to be unlocked by hospitality and travel companies with the vision, agility, and aptitude to apply these technologies to their core business.

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