

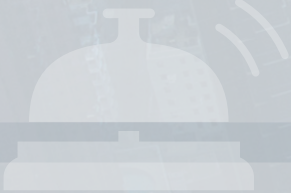
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HOSPITALITY



HOTEL 2025

emerging technologies destined
to reshape our business



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Predicting the future is impossible and attempting it might seem like folly. But as in most cases, it is the process – not the outcome – that matters more.

For hotel leaders, anticipating consumer trends and seeking innovations that enhance guest experiences are vital exercises that need to be practiced diligently. Now, more than ever – with the coming wave of disruptive technologies – taking these steps helps ensure success tomorrow.

To help in that pursuit, Oracle Hospitality commissioned *Hotel 2025*, a major industry report surveying consumers and operators about emerging technologies destined to reshape our business. Together, their responses provide insights about these innovations, including anticipated rate of adoption, potential impact and related fears – real and imagined – that need to be allayed.

Among the topics *Hotel 2025* explores: artificial intelligence, biometrics/facial recognition, robotics, voice activation, wearable technology, virtual reality, driverless transportation and smart hotel design. The report outlines the current status of each and forecasts its future use, and weaves in perspectives from 150 hotel operators. It also incorporates in-depth interviews with chief information officers and chief technical officers.

The path forward undeniably will rely on technologies that make hotels smarter, accelerate service and, most importantly, personalize experiences for each and every guest. *With Hotel 2025, it is our goal to help your business embrace innovation and prepare for the future.* It will be here before you know it.



Perspectives from
150 hotel operators:
To anticipate consumer
trends and seek
innovations that enhance
guest experiences

artificial intelligence

A field of computer science, artificial intelligence is the pursuit of developing computers that can simulate human intelligence – specifically, learning, reasoning and self-correction. Though the term was first coined in the 1950s, a seminal moment raising AI's profile in society came in 1997 when “Deep Blue,” an IBM chess program, defeated the legendary champion, Garry Kasparov. AI technology varies greatly in sophistication – from automation and reactive machines that can analyze options and select optimal ones, to limited-memory devices (as found in autonomous vehicles), which can use past experiences to shape future decisions. But the recent surge in AI research coincides with the advent of big data. **AI's ability to identify patterns and glean insights from data – now available faster and in greater quantity and variety – yields advantages to almost any industry.** All that remains for AI is for it to gain self-awareness, or a consciousness with its own beliefs and intentions. That remains in the realm of science fiction, but who knows for how much longer.



Hotel operators' top prediction for artificial intelligence: 72% of hotel operators said providing targeted dining recommendations using AI would be mainstream or in mass adoption by 2025.

Operators' other top uses for artificial intelligence:

- Recommendations for in-destination activities while guests are on-property
- Recommendations for hotel properties when consumers are shopping for hotels

artificial intelligence continued

current status

Thus far, hoteliers' most valuable application of AI, arguably, is the mining of consumer feedback to expeditiously create and deliver meaningful solutions for guests. With the sheer volume of data flooding hoteliers today, it's the type of analytical task that can't be done well, if at all, by a human. According to *Marketing Week*, luxury-hotel chain Dorchester Collection used an AI platform to conduct a brand study that contained 7,454 guest reviews from 28 different hotels and 10 major hotel brands across 18 cities and regions. On the guest-facing side of the equation, Hilton, at a property in McClean, Va., is experimenting with an **AI robot concierge that "talks" with guests**, providing information about the hotel and surrounding area. And in the UK, Edwardian Hotels offers a virtual host service called, "Edward." Designed for guests who prefer text messaging, Edward can respond to various requests, from arranging advance check in to supplying extra towels.

future use

As AI continues to evolve, industry experts predict that it will be able to observe and learn guests' behavior – even "perceive" their needs. Again, the importance of such capabilities boils down to improving hoteliers' ability to personalize the guest experience. In a prelude to such evolution, numerous hotels are experimenting with AI and voice-activated controls to optimize room conditions, such as lighting and temperature. In the *Marketing Week* article, Brian McGuinness, global brand leader for Aloft Hotels, said: **"We believe that by eventually weaving AI into the hotel experience, we can make a room smarter, giving guests more control over their stay."**



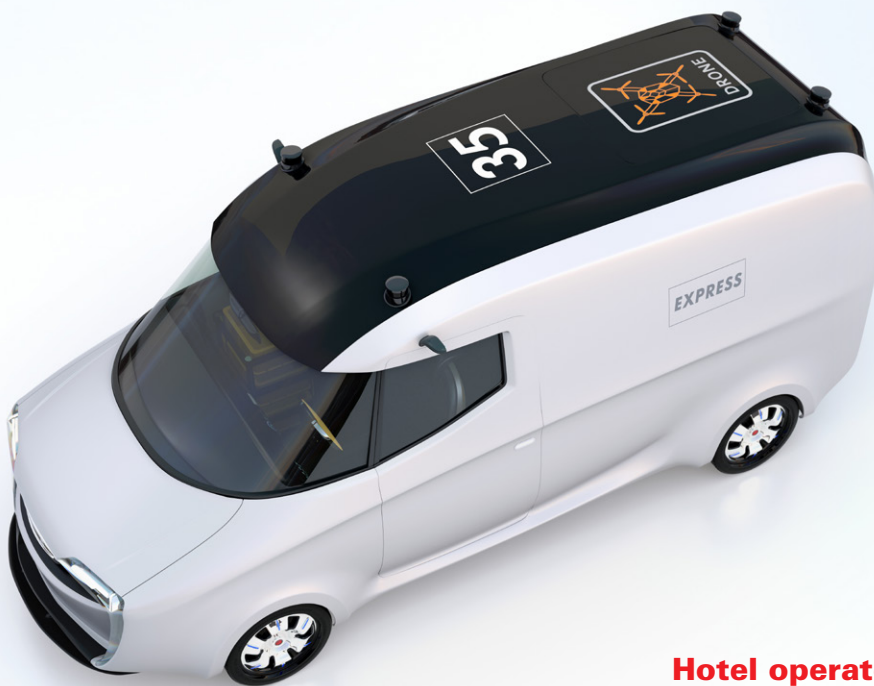
What the guests said:

- 47% of consumers said AI-based promotions based on past purchases would improve their experience, 26% would visit more often if hotels offered this service.
- 45% of consumers said AI-based promotions based on health/dietary needs would improve their experience, 28% would visit more often if hotels offered this service.

Artificial intelligence source: Maeve Hosea, "How brands are using artificial intelligence to enhance customer experience," *marketingweek.com*, (May 18, 2016)

driverless transportation

Driverless vehicles, often called AV for autonomous vehicles, are robotic vehicles that can navigate without human operators. Though numerous auto manufacturers and technology companies are pursuing AV development, Google's test of a fleet of self-driving cars traveling more than 140,000 miles of California roads captured the public's attention. In Google's case, sophisticated orchestration of multiple technologies – including sensors, radar, AI software and Google Maps – enables the car to safely steer and brake until reaching its programmed destination. Though consumers have been wary of driverless vehicles, advocates say the technology leads to **safer, more reliable and efficient travel**. Aside from eliminating accidents caused by human error, they say automated transportation would improve traffic management, minimizing congestion and delays.



Hotel operators' top prediction for driverless transportation: 64% of hotel operators said driverless neighborhood shuttles would be mainstream or in mass adoption by 2025.

Operators' other top uses for driverless transportation:

- Airport pickup/drop-off
- Guest luggage handling
- Delivery of supplies to hotels

driverless transportation continued

current status

Earlier this year, the Alliance for Transportation Innovation, a consortium of transportation technology innovators, hosted test rides for the public in its Autonomous Vehicle Shuttle in Arlington, Texas. Initially, its inventors anticipate the driverless vehicle would transport people between stadiums and off-site parking lots, but it's not much of a stretch to envision it, one day, shuttling guests to and from hotels. In fact, the shuttles – made by French company, EasyMile – are expected to be on public streets transporting workers near a San Ramon, Calif., office park by the end of 2017. The AV, which uses GPS navigation and is equipped with sensors that detect obstacles, would be the first driverless shuttle in the U.S. to operate on public roads.

future use

The race to develop autonomous vehicles is well under way with companies ranging from Google to Tesla to Honda in the thick of it. The impact of AVs on consumer behavior, however, is what will have seismic consequences for hoteliers. Indeed, in a recent report, *Business Insider* forecasted as many as 10 million self-driving cars could be in use as early as 2020. That could mean travelers hopping into AVs, sleeping comfortably in reclining seats and being transported to new destinations overnight. Depending on hoteliers' response to futuristic travel, such changes could lead to expanding market boundaries or risks of being bypassed altogether.



What the guests said:

- 47% of consumers said driverless vehicles for neighborhood transportation would enhance the guest experience. 31% would stay more often if offered this service.
- 50% of consumers said driverless vehicles for airport pickups and drop-offs, would enhance the guest experience. 34% would stay more often if offered this service.

Driverless transportation sources:

David Budmir, "5 ways self-driving cars will forever disrupt the future of hospitality," socialtables.com, (Oct. 19, 2016)

Angela Ruggiero, "San Ramon: Driverless shuttles make their debut," eastbaytimes.com, (March 7, 2017)

Ben Russell, "Driverless shuttle being tested in Arlington," nbcdfw.com, (Feb. 2, 2017)

voice activation/recognition

Voice-activation technology is exactly what the name implies: devices and systems controlled by the human voice. **Without the need to use switches, dials and buttons, voice activation affords simple, hands-free capability, freeing users to perform other tasks.** Performance of voice-recognition technology has improved significantly; in 1995, “word error rate” hovered around 43%, but now devices are considered to be as fluent as human speech. Indeed, such enhancements are reflected in the quick adoption of voice-activated digital assistants such as Google Home and Amazon Echo. Consumer Technology Association projects total unit sales of these devices to double to 10 million in 2017.



Hotel operators' top prediction for voice activation/recognition: 78% of hotel operators said voice-activated controls for lights, air conditioning, and room devices would be mainstream or in mass adoption by 2025.

Operators' other top uses for voice activation/recognition:

- Guest recognition
- Ordering room or hotel services

voice activation/recognition continued

current status

A typical hotel guest spends at least 12 to 15 minutes trying to figure out how to operate or adjust the thermostat, lights, TV controls and other room functions. In the continuous quest to deliver hassle-free guest experiences, such issues need improvement and hoteliers are turning to voice-activated solutions. **The idea? Manage all those functions under one system, controlled only with voice commands.** According to *USA Today*, Aloft Hotels, in select locations, began deploying iPads in rooms last year, enabling guests to adjust temperature and lighting by simply asking “Siri,” Apple’s voice assistant. Similarly, Wynn Las Vegas became the first resort in the world to place Echo, Amazon’s voice-activated smart speaker, in all of its guest rooms – a total of 4,748 – to control various aspects of the room environment.

future use

With the hotel room of the future evolving increasingly into a personalized haven, the widespread adoption of voice-activation seems a given. Indeed, the evidence is mounting: According to *Hospitality Technology’s 2017 Lodging Technology Study*, 42% of respondents acknowledged the value of artificial intelligence/voice-activated devices. **However, like many new technologies, voice activation will need to overcome guest privacy concerns.** Meanwhile, other voice-related industry applications are emerging, too: A training app designed to prep customer-service employees uses voice analysis to gauge their confidence level in simulated business scenarios.



What the guests said:

- 59% of consumers said voice-activated controls for lights, air conditioning, and room devices would enhance the guest experience, 36% would stay more often if offered this service.
- 50% of consumers said voice-activated orders for room service or other hotel services would enhance the guest experience, 33% would stay more often if offered this service.

Voice activation/recognition sources:

Nancy Trejos, “Aloft Hotels debut voice-activated rooms,” *usatoday.com*, (Aug. 24, 2016)

“2017 Lodging Technology Study / Frictionless Hotels: Enabling the Omni-Experience,” *hospitalitytechnology.edgl.com*, (Dec. 20, 2016)

wearable technology

Thanks to the explosion of smart watches and fitness trackers, wearable technology or “wearables” are becoming as ubiquitous as cell phones. But the terminology encompasses all forms of electronic technologies or computers that can be incorporated into accessories or clothing and worn on the body. **That makes an array of objects, from watches to contact lenses to fabrics to jewelry, potential candidates as wearables.** Among their signature traits: Providing users with data-input capabilities and real-time access to information – all in continuous, convenient, seamless fashion.



Hotel operators’ top prediction for wearable technology: 71% of hotel operators said wearable technology for staff scheduling and training would be mainstream or in mass adoption by 2025.

Operators’ other top uses for wearable technology:

- Guest ordering and payment
- Staff access to hotel and workstation log-in

wearable technology continued

current status

The benefits of wearables, as just mentioned, are perfectly suited for the hotel industry. Imagine arriving late to a hotel and just wanting to go straight to your room, bypassing the front desk and fetching keycards. At some major hotel chains, guests with wearables can do just that with a simple swipe of their wrists providing access. Westin Hotels, catering to growing public interest in wellness, has provided their own specialized devices to guests: sleep-sensing wristbands to help monitor rest. Wearables also are being used today as a secure payment option – improving quality and speed of service for guests, not to mention avoiding higher-risk transactions with credit/debit cards.

future use

As wearables become more prolific, hoteliers likely will use them as tracking devices to gain invaluable insights about guests' behavior and preferences. For example, hoteliers could monitor their use of amenities and services, and even keep tabs of purchases. According to hospitalityupgrade.com, Walt Disney World Resort already uses the technology to analyze guests' buying patterns, which plays a key role in improving inventory management and reducing waste. Staff-focused wearable technology hasn't been embraced as readily, but its adoption certainly can be envisioned: For hotel maintenance and hospitality staff, hands-free operation afforded by wearables could improve response time and yield more detailed, record-keeping. Likewise, busy hotel bartenders and waiters could receive notifications via wearables, alerting them when meals and drinks are ready for pickup or when guests need prompt attention.



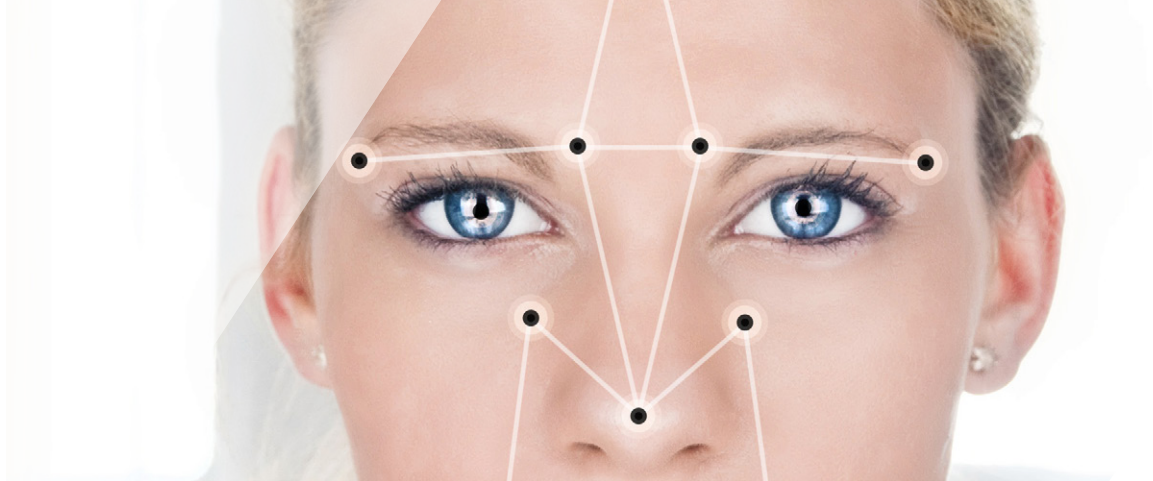
What the guests said:

- 36% of consumers said wearable technology that allows hotels to recognize guest would enhance the guest experience, 19% would stay more often if offered this service.
- 32% of consumers said wearable technology that allows hotels to personalize offers would enhance the guest experience, 20% would stay more often if offered this service.

Wearable technology source: Brendon Granger, "What is the future of wearable technology in hotels?" hospitalityupgrade.com, (Nov. 6, 2015)

biometrics and facial recognition

Broadly defined, biometrics refers to the use of measurable biological data in technology. It is most commonly applied as a means of identification and access control, and its potentially broad impact prompted a 2016 *Juniper Research* report to rank it the number one technology to transform ecommerce. Biometrics uses distinctive characteristics, both physiological and behavioral, to identify individuals. Rather than use passwords or tokens to validate identity, biometrics performs that task more securely and effectively by using identifiers such as fingerprints, DNA and retinas. Facial recognition, which is the analysis of facial characteristics, also is a form of biometrics. **From fun, social uses such as identifying friends on Facebook to high-level security and surveillance, facial recognition is fast-becoming a part of the societal mainstream.**



Hotel operators' top prediction for biometrics and facial recognition: 74% of hotel operators said automating staff recognition with biometrics would be mainstream or in mass adoption by 2025.

Operators' other top uses for biometrics and facial recognition:

- Personalizing guest interactions
- Room lock/unlock

biometrics and facial recognition

continued

current status

Facial recognition, arguably, is an essential technology for hoteliers in pursuit of creating personalized and individualized guest experiences. Solutions exist today that enable hotel security cameras to identify guests in real time, using facial characteristics previously captured and stored in the hotel's property management system. Such capability yields a variety of opportunities for hotel staff, including providing special services and attention to VIP guests. As for employee management, hotels are readily adopting the use of fingerprints and hand geometry for identification.

future use

Ease of use, faster guest service and improved security all bode well for the adoption of biometrics. It is expected to have a profound impact on commerce, especially in payment authentication. Hotel guests will be able to pay for virtually anything on property in such fashion; they'll "link" their fingerprints to a credit card, then pay for services or meals by simply touching a biometric reading device. Already in development, too, are biometric ID systems that will replace hotel key cards. Guests could enter hotels using such systems anywhere in the world and have the property recognize them – and their preferences – based on information registered with their fingerprints. Use of facial recognition likely will become widespread as well. But it will face stiffer privacy concerns. About the topic, U.S. Senator Al Franken cautioned in a public letter: **"Unlike other biometric identifiers such as iris scans and fingerprints, facial recognition is designed to operate at a distance, without the knowledge or consent of the person being identified."**



What the guests said:

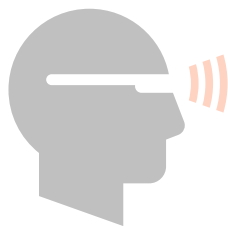
- 62% of consumers said automated recognition using biometrics and facial recognition would enhance their experience, 41% would visit more often if hotels offered this service.
- 56% of consumers said locking and unlocking rooms using biometrics and facial recognition would enhance their experience, 29% would visit more often if hotels offered this service.



Biometrics and facial recognition source: "Top disruptive technologies in digital commerce for 2016," juniperresearch.com, (Feb. 9, 2016)

virtual reality

A three-dimensional, computer-generated environment that can be explored by an individual, virtual reality still may be best known for its use with video games. But its ability to enable users to manipulate objects or execute a series of actions in a “virtual world” – with special sensory equipment (headsets and data gloves) – has made it an indispensable tool for industry. **For nearly three decades, VR has been used for training, especially for dangerous or difficult tasks.** Among its earliest applications: Flight cockpit simulators to train pilots. Now, VR is used routinely, from helping surgeons prepare for complex operations to aiding scientists tackle problems involving molecular structure.



Hotel operators’ top prediction for virtual reality: 68% of hotel operators said virtual reality for staff training would be mainstream or in mass adoption by 2025.

Operators’ other top uses for virtual reality:

- Guest entertainment on property
- Meeting rooms – to see setup styles

virtual reality continued

current status

As part of its “Travel Brilliantly” campaign, Marriott International incorporated VR technology in large booths in New York City, where guests could “transport” themselves to destinations such as London’s Tower 42 or sun-drenched Hawaiian beaches. According to [hotelexecutive.com](#), **the VR experience enveloped participants with sights, sounds, scents and even climate conditions such as heat and mist.** The campaign’s intent: Connect with and inspire travelers, especially tech-savvy millennials, to book a trip. Similarly, some hotels already are using VR to showcase their property to prospective guests: Imagine experiencing breathtaking views from a hotel balcony or being whisked away on a helicopter tour.

future use

Market researchers are predicting that **consumer sales of VR devices may exceed 38 million units by 2020**, according to [Hotel Business Review](#). And some think they will become as ubiquitous as mobile devices – perhaps, even given away with cell phone contracts. Such mainstream adoption paves the way for hoteliers to embrace virtual reality marketing, but it will also intensify demand for more innovative and individualized approaches. Still, its promise cannot be ignored. The HBR article cited Don Anderson, managing director of We Are Social Singapore, as saying: “Virtual reality allows marketers to deliver stories and richer content experiences that traditional forms of advertising can’t match.”



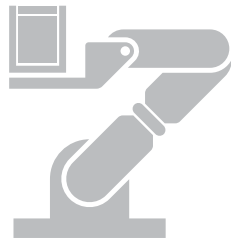
What the guests said:

- 66% of consumers said virtual reality tours of properties during booking would enhance their experience, 45% would visit more often if hotels offered this service.
- 44% of consumers said virtual reality lounges for entertainment would enhance their experience, 31% would visit more often if hotels offered this service.

Virtual reality source: Abi Mandelbaum, “Everything hotels need to know about virtual reality marketing,” [hotelexecutive.com](#)

robotics

A branch of computer science and engineering, robotics deals with the design, construction, operation and application of robots. Popularized by the legendary science-fiction author Isaac Asimov in the 1950s, robots of all shapes and sizes perform countless tasks today, often substituting for humans in industrial manufacturing or dangerous situations such as bomb detection. **They can be programmed to perform virtually any task a human can do,** including basic functions such as walking, talking and lifting. The use of robotics is limited only to the imagination, which explains its widespread adoption in commercial fields, domestic environments and military endeavors.



Hotel operators' top prediction for robotics:

68% of hotel operators said use of robots for check-in and checkout would be mainstream or in mass adoption by 2025.

Operators' other top uses for robotics:

- Room cleaned by a robot
- Greeted or served by a robot

robotics continued

current status

At the Henn-na Hotel in Japan, arriving guests are welcomed by a hostess who bows and says, "Welcome." But nothing about this scenario is ordinary, because the hostess isn't human – she's a robot. Henn-na executives are investing in robotics now with the long-term objective of having 90 percent of all hotel tasks handled by robots. It is an ambitious goal, and certainly not one that is achievable anytime soon, or even desired, by most hotels. After all, the notion of robots replacing humans isn't wholeheartedly supported by consumers – at least not yet. But some guests are intrigued by or enjoy the novelty, and the potential of lowering labor costs and improving operations means hoteliers will continue to explore the technology.

future use

For full-scale adoption in the hotel industry, however, experts say robots will need to be infused with artificial intelligence. According to hospitalitynet.org, some research indicates that the material impact of AI-enhanced automation will affect nearly half of all industries in the next 20 years. For hoteliers, that could mean robots that not only greet guests, but demonstrate the capability to *learn* their needs and preferences during the course of their stay. The real value of robots likely won't be greater savings or reduced errors; it's the potential to deliver unmatched experiences that differentiate the hotel brand and increase guest loyalty.



What the guests said:

- 41% of consumers said robots being used for cleaning would enhance their experience. 22% would visit more often if hotels offered this service.
- 33% of consumers said robots being used for greeting and serving guests would enhance their experience. Only 22% would visit more often if hotels offered this service.

Robotics source: Mitrankur Majumdar, "Here's how automation is transforming the hospitality industry," hospitalitynet.org, (April 5, 2016)

smart hotel design

Smart hotel design is a term with broad interpretations, but at its core it means **using technology to personalize for the guest every conceivable aspect of the property** – from its open space to the products and services it offers. In essence, technology becomes a tool that affords designers the ability to reconfigure everything, from guest rooms to restaurants, to create unique, memorable experiences that travelers can't wait to share with friends – and on social media.



Hotel operators' top prediction for smart hotel design: 85% of hotel operators said smart door locks would be mainstream or in mass adoption by 2025.

Operators' other top uses for smart hotel design:

- Smart temperature and lighting controls
- Flexible meeting spaces

smart hotel design continued

current status

The “home-away-from-home” design philosophy, already popular, is being embraced even more. It is most evident, perhaps, in hotel lobbies, where enhanced technology is streamlining check-in and helping minimize formal, front-desk environments. Instead, hotels are opting for living-room settings that invite guests to lounge and relax – as staff, empowered with mobile devices, cater to their needs. In-room design also is evolving as many hotels provide technology upgrades allowing guests to listen or view their entertainment content on mobile devices. Likewise, use of voice-activation technology that can personalize room environments, such as lighting and temperature, is helping produce more simplified rooms with cleaner aesthetics.

future use

The growth in wellness hospitality is bound to make hoteliers reevaluate exterior and interior designs to better accommodate health-conscious travelers. With the explosion in wearable technology, which tracks users’ health data, futurists anticipate hotel fitness centers, spas and retreats will be redesigned to promote interactivity with such devices. The escalating emphasis on sustainability also is expected to have a profound effect, likely involving Internet of Things technology that will enable hotel systems to “talk to each other” to automatically improve energy conservation – for example, better water management or use of solar panels. Ultimately, technology-infused design will yield “creative space segmentation,” giving guests access to a menu of areas, promoting social encounters as well as peace and tranquility.



What the guests said:

- 65% of consumers said modern hotel designs with smart locks, smart lighting and room controls, audio and video streaming would enhance their experience, 43% would visit more often if hotels adopted modern designs.
- 59% of consumers said modern hotel designs with more meeting areas, wall TVs, and gaming lounges would enhance their experience, 37% would visit more often if hotels adopted modern designs.

Smart hotel design source: “11 innovative hotel design trends to watch for in 2017,” alvarezdiazvillalon.com, (Nov. 17, 2016)

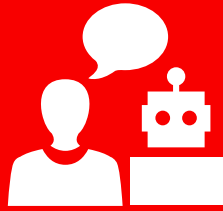


CONCLUSION

In developing guidelines for technology adoption, here are four takeaways for consideration:

The technologies highlighted in *Hotel 2025* will inevitably redefine the hotel industry. But whether they yield success depends upon the ability of operators to separate fact from fiction, and apply innovations that produce real benefits for guests – and earn their blessing.

- 1 Technology's great purpose is to grant guests the power of control.** Hoteliers, at times, have been wary of technology, expressing concern that it might extract the human element from service. It's a legitimate issue, but should be kept in context. Guests aren't ready yet for automatons without empathy or understanding, but they want hoteliers to use technology to improve their stays. Innovations that provide guests with greater control or customization are particularly important. Case in point: 59% said using a voice-activated device to control room lighting/temperature would enhance the guest experience.
- 2 The real world isn't always hospitable – provide an alternative.** For many guests, hotels represent an escape. Amplify that opportunity with virtual reality. There is high awareness of VR among consumers, which likely is contributing to their acceptance of it: 66% said VR tours of a property during booking would be beneficial, and 44% approved of VR lounges as an entertainment option. And if virtual reality is a great simulation training tool for soldiers and surgeons, there's no reason to think it wouldn't benefit hotel staff, too. Nearly 70% of operators said VR will serve that purpose by 2025.
- 3 Innovations that deliver personalization are priceless.** For operators, there are many technologies – when used appropriately – that can help with this effort. In an era of individualization, these technologies deserve consideration: facial recognition (62% of consumers said being recognized automatically would enhance their stay); artificial intelligence (47% approved of receiving suggestions based on past purchases); and wearable devices (70% of operators said it will be in wide use for guest ordering and payment). However, any attempt to personalize needs to be measured with respect for guest privacy.
- 4 Intelligent automation means faster, cheaper and potentially better.** In the future, automation is set to perfect efficiency, optimizing scale and speed of service. In hospitality that addresses one part of the equation, but leaves another unresolved: intuition to perceive guests' needs. Which explains why robots likely will tackle repetitive tasks such as cleaning, but stay clear of meaningful guest service. Likewise, driverless shuttles for airport transportation show real promise – with 50% of consumers saying they would use the service.



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OracleHosp_ww@oracle.com

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