AI & Robots in HoReCa: Potential mid-term Impacts

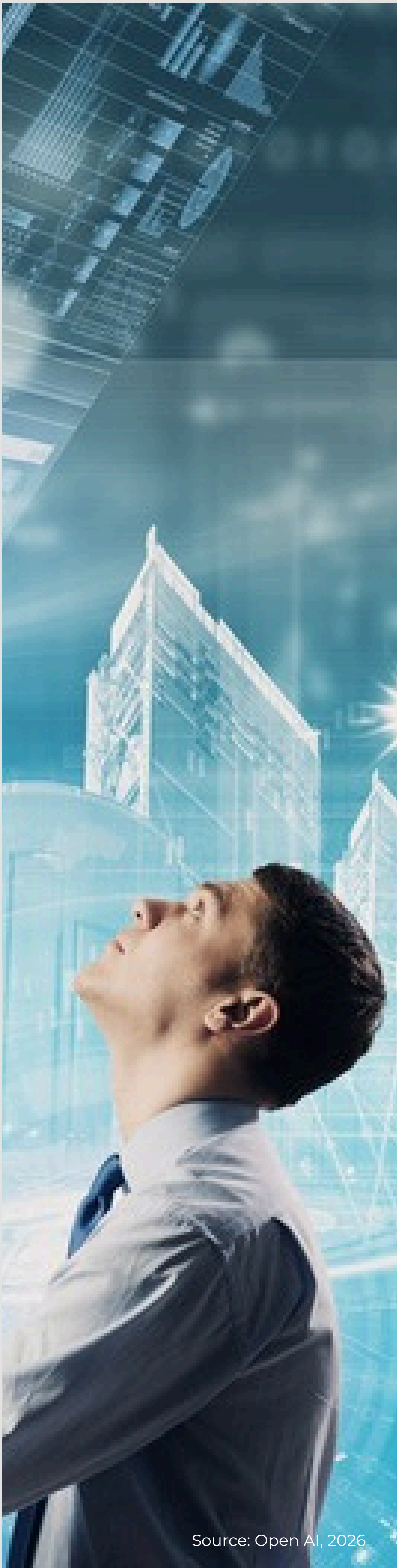
A Buffet that Thinks Ahead

Thematic Report

Lucy Petters (20054), Iryna Volokitina (20700), Stefanie Zimmermann (19978)
School of Business Studies, Hochschule Stralsund
INNOM1720: Foundations for Innovation III
Prof. Dr. Björn P. Jacobsen
June 25, 2026

Source: Open AI, 2026

TABLE OF CONTENTS



Source: Open AI, 2026

Source: Open AI, 2026

Executive summary

Hotel buffets have long been built around a simple promise: abundance. Full trays, a wide variety of food, and constant availability have long been used to assess the quality of breakfast, both by guests and hotels. Yet this model comes with a cost that is increasingly difficult to ignore. According to the United Nation Environment Program, over one billion meals are wasted globally every single day, with food service operations, including hotels, accounting for 28 percent of that total (UNEP, 2024a). Within the hospitality sector, the breakfast buffet is one of the most waste-intensive operations. Food is prepared before demand is known, trays are refilled based on visual judgment rather than actual consumption data, and overproduction is often treated at the safer option to avoid any impression of scarcity (Appel, Ayalon and Collins-Kreitner, 2025).

Addressing this problem through traditional means, staff training, portion control, or revised menu planning, has produced only limited results, largely because the underlying decision-making process remains reactive and intuition based. What is increasingly being discussed, though not yet wildly implemented, is a different approach: using artificial intelligence to make buffet replenishment smarter, more adaptive, and less wasteful, without compromising the guest experience that hotels depend on.

Therefore, this paper examines AI-guided buffet replenishment as a weak signal, an early-stage development that is not yet mainstream but carries real potential to reshape how hotel breakfast operations are managed over the midterm.

Source: Open AI, 2026

Drawing on academic literature, industry evidence, and primary observations gathered during a visit to Viva Technology 2026 in Paris, the paper maps the current landscape of AI in hospitality food service, develops a future scenario set in 2030, and discusses the strategic implications, adoption dynamics, and barriers that would shape the transition from where the industry currently stands to where this technology could take it. The goal is not to predict the future, but to make the direction of travel visible enough to act on.

Current Landscape & Emerging Developments

A key component of hospitality service, especially for breakfast operations, has long been the hotel buffet. Conventional buffet systems allow guests to freely choose food while preserving a sense of variety and generosity, as they are built around abundance, accessibility, and guest autonomy (Kallbekken and Saelen, 2013). Since it facilitates high guest throughput and produces a favourable service impression, this format is strongly embedded in the hospitality sector. However, there are also significant inefficiencies that come with traditional buffet operations.

Staff intuition and manual observation play a major role in traditional buffet management. Workers estimate preparation quantities based on past experience rather than data-driven forecasting, visually monitor food levels, and determine when replenishment is necessary. This frequently leads to excessive food waste, overproduction, and unnecessary replenishment, particularly during breakfast service when demand varies based on occupancy levels, guest demographics, event schedules, and departure patterns (Filimonau et al., 2019). These inefficiencies illustrate that food waste in buffet settings cannot be understood as the result of isolated operational decisions alone, but rather as the outcome of a complex system shaped by multiple interrelated behavioural, situational, and structural factors (Puga-Gonzalez et al., 2025). The interaction between fluctuating guest demand, service design, staff decision-making, and temporal dynamics creates non-linear patterns and feedback loops that make food waste difficult to predict and manage using conventional approaches.


Source: Canva, 2026

Source: Canva, 2026

In recent years, the hospitality industry has begun integrating artificial intelligence and smart infrastructure to address these inefficiencies. Recent research highlights that AI-supported operational systems enable more responsive decision-making through real-time analytics, predictive forecasting, and automated optimisation processes (Puga-Gonzalez et al., 2025; Sigala et al., 2025). AI-driven buffet systems therefore aim to transform buffet management from reactive and intuition-based operations into predictive, adaptive, and data-supported systems. By accounting for the complexity of buffet operations and continuously learning from dynamic consumption patterns, such systems offer a more effective approach to reducing food waste while maintaining operational efficiency and service quality.

Although fully adaptive AI-guided buffet replenishment systems are not yet widely implemented in hospitality, several enabling technologies have already entered hotel food and beverage operations. Current applications primarily focus on food waste monitoring, demand forecasting, inventory optimisation, and operational decision support. AI-powered waste-tracking solutions such as Orbisk and Winnow combine computer vision, machine learning, and weighing technologies to automatically identify and quantify food waste generated during buffet service.

These systems provide managers with detailed information on waste volumes, waste composition, and operational inefficiencies, enabling more informed decisions regarding purchasing, food preparation, and menu planning (Sigala et al., 2025).

Beyond waste tracking, AI-driven forecasting tools increasingly support hotels in predicting food demand. These systems use data from occupancy rates, historical consumption patterns, weather, event schedules, seasonal fluctuations, and guest characteristics to estimate demand more accurately than traditional forecasting methods (Buhalis and Leung, 2018).
. AI allows hotels to better align production and inventory levels with expected consumption patterns by converting large amounts of operational data into actionable insights. This capability is especially useful in breakfast buffet operations, where demand varies greatly between weekdays, weekends, seasons, and guest segments.

Recent empirical evidence further highlights the potential of AI applications in food waste reduction. Sigala et al. (2025) examined the implementation of an AI-based automated waste-tracking system across various hospitality establishments. The system utilised computer vision and machine learning technologies to monitor and analyse food waste in real time, enabling managers to identify waste hotspots and implement targeted corrective measures. The findings demonstrated reductions in food waste ranging from 23% to 51%, with the greatest improvements occurring in food preparation processes and the reduction of overproduction. Furthermore, the study reported a decrease in food waste costs per meal of up to 39%, illustrating that AI-driven waste management can simultaneously generate environmental and economic benefits.


Source: OpenAI, 2026

Emerging developments go beyond waste measurement and forecasting to the creation of smart buffet infrastructures. Sensor-equipped buffet stations, Internet of Things (IoT) technologies, and computer vision systems are becoming more capable of monitoring food levels, consumption speed, and replenishment requirements in real time (Tussyadiah, 2020). When combined with AI algorithms, these technologies enable context-aware replenishment decisions that take into account not only the remaining food quantity, but also service duration, guest flow, historical consumption patterns, and projected future demand (Sigala et al., 2025). While these technologies are still in the early stages of adoption, they represent a broader shift away from reactive buffet management and toward adaptive, predictive, and data-driven operating models. As these technologies become more mature and accessible, they are expected to create significant opportunities for hospitality organisations.

Source: Stefanie Zimmermann, 2026


Source: Canva, 2026

Opportunities of AI-Guided Buffet Management

The increasing integration of AI technologies creates several opportunities for the hospitality industry. One of the most significant advantages is cost savings from reduced food waste and more efficient resource allocation. Food waste is both an environmental and financial issue, as it incurs costs for procurement, preparation, storage, and disposal (Filimonau and De Coteau, 2019; UNEP, 2024). By improving forecasting accuracy and replenishment decisions, AI systems can reduce overproduction while maintaining product availability, thereby improving operational profitability. Furthermore, continuous collection and analysis of operational data allows hotels to develop learning mechanisms that improve decision-making over time.

Sustainability represents a second major opportunity. The hospitality industry is under increasing pressure from regulators, investors, and consumers to reduce its environmental impact and improve resource efficiency (Filimonau and De Coteau, 2019; UNEP, 2024). Food waste has become a particularly pressing sustainability issue, with the United Nations Environment Programme estimating that over one billion meals are wasted globally each day (UNEP, 2024). AI-supported buffet management can help to achieve sustainability goals by reducing unnecessary food production, reducing waste generation, and providing detailed data for sustainability monitoring and reporting. By identifying food waste patterns and operational inefficiencies, AI systems enable managers to make evidence-based decisions about food preparation, portioning, and inventory management (Sigala et al., 2025). These insights support both environmental performance improvements and cost savings, creating a strong business case for adoption.

Source: OpenAI, 2026

Operational efficiency is another opportunity. Traditional buffet management is heavily based on continuous manual monitoring and staff experience. Employees must regularly inspect buffet stations, forecast future demand, and determine when replenishment is required. AI-powered systems can automate parts of this process by providing real-time recommendations and alerts, reducing routine monitoring activities and facilitating more efficient labour allocation. Rather than replacing employees, AI increasingly functions as a decision-support technology that augments human capabilities and enables staff to focus on higher-value service activities (Ivanov and Webster, 2019).

Additionally, AI technologies have the potential to improve guest experiences. Improved demand forecasting and replenishment timing can reduce stockouts while keeping food fresh during service periods. Guests benefit from increased product availability, higher quality food, and more consistent service standards. Furthermore, AI-generated insights may help with personalisation by identifying consumption patterns across different guest segments and allowing hotels to adjust offerings accordingly (Appel et al., 2025). As personalisation becomes a more important competitive differentiator in the hospitality industry, AI-driven analytics could assist hotels in providing more responsive and guest-centered service experiences.

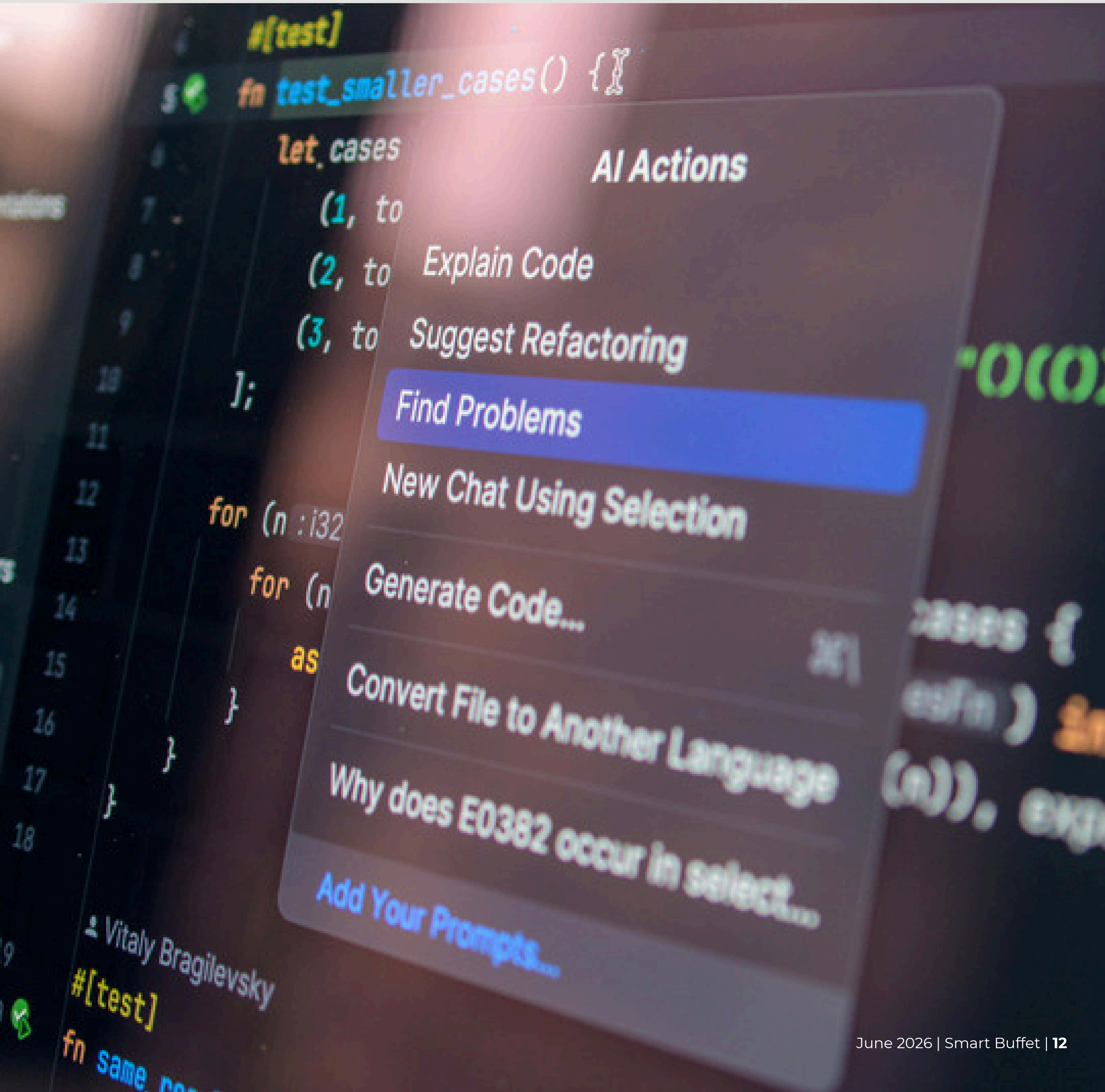
Challenges and Risks of AI Adoption

Despite these opportunities, implementing AI-enabled buffet management systems poses significant challenges. One concern is that the traditional hospitality atmosphere may be damaged. Historically, hotel buffets have used visual abundance to represent generosity, quality, and value (Kallbekken and Saelen, 2013). If optimisation strategies become overly focused on efficiency, buffet displays may appear less abundant, potentially affecting guest perceptions even when food availability remains sufficient. Maintaining a proper balance between operational efficiency and the experiential aspects of hospitality is thus a critical managerial challenge.

Another issue involves data privacy and ethical concerns. Many AI applications rely on large amounts of operational and guest-related data, such as consumption patterns, booking information, and demographic characteristics. While such data improves forecasting accuracy and decision quality, it raises concerns about privacy, transparency, data ownership, and algorithmic fairness (Dwivedi et al., 2021). As a result, hospitality organisations must ensure compliance with legal frameworks such as the General Data Protection Regulation (GDPR), while also maintaining guest trust and transparency about data usage.

Employee resistance could further stymie implementation efforts. Research suggests that hospitality employees may perceive AI and automation technologies as threats to employment opportunities and professional roles, leading to resistance to implementation and adoption (Tussyadiah, 2020). Employees may perceive monitoring systems as mechanisms of surveillance or control rather than operational support tools. Successful implementation necessitates effective change management, employee training, and open communication about AI's complementary role in hospitality operations.

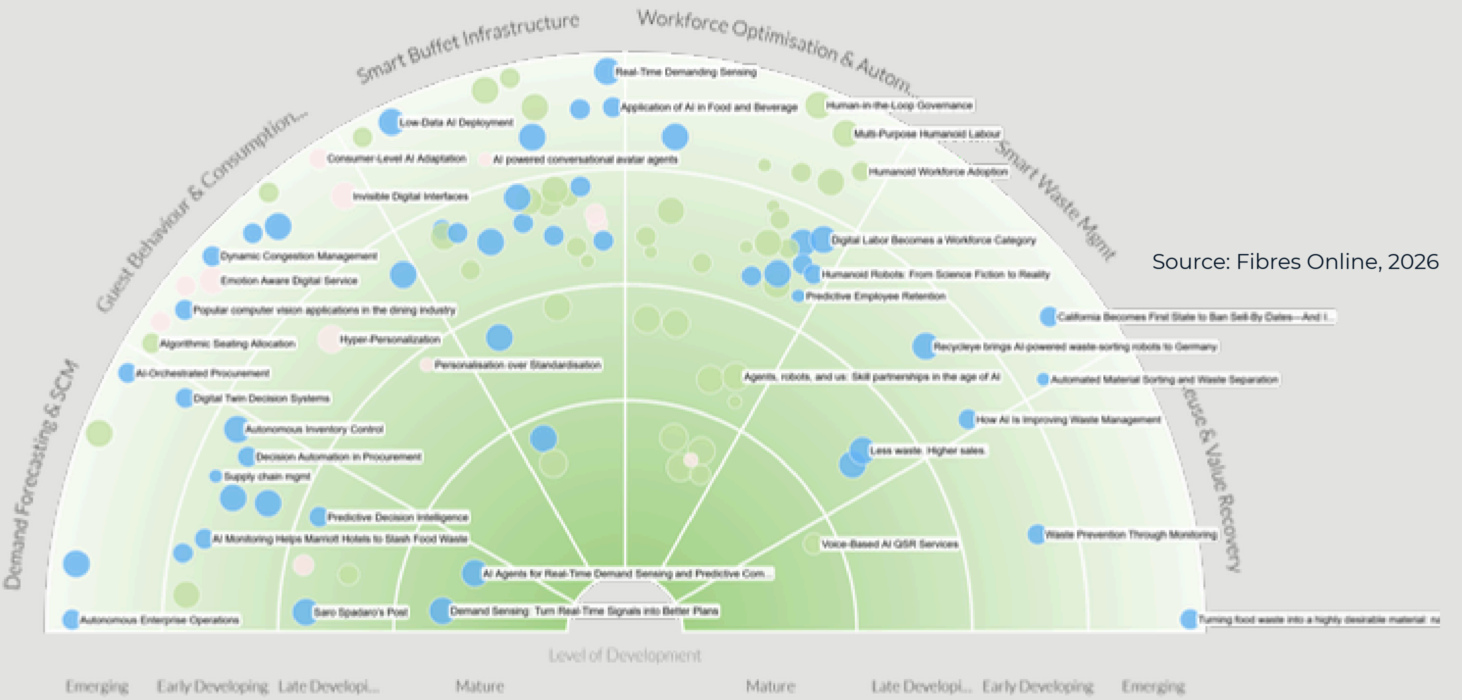
Finally, the increasing reliance on technological infrastructure introduces operational risks. AI systems rely on accurate data inputs, functional sensors, dependable software platforms, and consistent network connectivity. Technical failures, poor data quality, algorithmic bias, or system malfunctions can lead to incorrect replenishment recommendations and operational disruptions. As a result, human oversight is still necessary to ensure service continuity and avoid over-reliance on automated decision-making processes (Ivanov and Webster, 2019).



Methodology

To find new trends that might have an impact on buffet management in the hotel sector going forward, the study used a weak signal scanning technique. Although they are now marked by low visibility and restricted acceptance, weak signals are early indicators of potentially major future developments that could eventually become influential trends (Hiltunen, 2008). Weak signals, in contrast to well-established trends, can seem dispersed and ambiguous, necessitating methodical observation and analysis to determine their potential future significance.

To gather signals on artificial intelligence, food waste reduction, smart hospitality, Internet of Things (IoT), computer vision, demand forecasting, and automation in food service operations, a horizon scanning procedure was carried out. Information was obtained from news stories, industry publications, technology suppliers, peer-reviewed academic literature, and case studies related to hospitality. While lowering the risk of depending solely on one information source, gathering evidence from a variety of source types enhanced the diversity of signals found.



Source: Fibres Online, 2026

Trend Radar Development

Following the collection of weak signals, the identified developments were organised into a trend radar. Trend radars are widely used in strategic foresight to visualise emerging developments according to their thematic relevance and stage of maturity, thereby supporting strategic decision-making and innovation planning (Rohrbeck et al., 2015). To provide a structured overview of the identified signals, they were grouped into six thematic segments representing the main capability areas expected to influence the future of buffet management: Demand Forecasting & Supply Chain Management, Guest Behaviour & Consumption Analytics, Smart Buffet Infrastructure, Workforce Optimisation & Automation, Waste Management, and Resource Value Recovery. These segments were not predefined but emerged inductively from recurring themes identified during the scanning process. Grouping related signals into thematic clusters enabled the identification of technological interdependencies and broader transformation patterns across the hospitality sector.

To evaluate the maturity of the identified developments, each signal was subsequently classified into one of four development stages: **Emerging, Early Developing, Late Developing,** or **Mature**. The classification was based on technological readiness, market adoption, evidence from academic literature, and the extent of practical implementation within hospitality operations. Technologies already established in commercial kitchens, such as AI-supported food waste monitoring systems, were therefore classified as **Mature** or **Late Developing**, whereas fully autonomous buffet replenishment systems integrating predictive analytics, IoT infrastructure, and AI-driven decision support were categorised as **Emerging**, reflecting their increasing technological feasibility but limited real-world adoption.

Cluster Selection and Scenario Development

The final methodological step involved identifying clusters of interconnected signals with high strategic relevance. Rather than focusing on individual technologies, the analysis emphasised the interaction between multiple developments across different segments of the trend radar.

To complement the literature review and secondary data analysis, additional observations were gathered during a visit to **Viva Technology 2026 (VivaTech)** in Paris, one of Europe's largest technology and innovation events. The exhibition provided direct insights into emerging AI applications, robotics, smart infrastructure, and automation technologies that are currently shaping future business environments. Observing technology demonstrations, interacting with exhibitors, and analysing showcased innovations helped validate the relevance of the identified weak signals and provided additional evidence for emerging developments with potential applications in hospitality.

The selected cluster combined developments in AI-supported waste tracking, demand forecasting, computer vision, IoT-enabled buffet monitoring, and workforce decision support. Together, these signals indicate a broader transition from reactive buffet management towards adaptive, predictive, and AI-guided operations. This convergence formed the foundation for the future scenario presented in the subsequent section. The scenario therefore represents a plausible future development based on the convergence of multiple technological and operational trends that are already emerging across the hospitality and AI sectors.

Prologue: The Abundance of Food

Hotel breakfast buffets are usually concentrated on abundance. They offer a wide variety of foods, full trays, and constant availability in order to showcase high-quality service. The buffet is a part of guest experience, this is why it is essential to adhere to high standards. However, abundance also creates a number of problems including unnecessary waste, labour intensity, and increased costs.

According to the United Nations Environment Programme (UNEP), the total food waste across the globe aggregated to 1.05 billion tonnes in 2022. While households account for the largest share, representing 60 percent of the total, food services are responsible for 28 percent (UNEP, 2024).

This problem is particularly relevant for hotel buffets as they are usually designed to show visual fullness. The food is prepared before the demand is known, and staff may want to refill some trays in order not to risk guest dissatisfaction (Appel, Ofira Ayalon and Noga Collins-Kreiner, 2025). For this reason, buffet operations are a relevant setting to explore how AI and robotics could influence HoReCa in the mid term.


Source: Stefanie Zimmermann, 2026

The replenishments of the buffets usually demand reactive decision-making: chefs or food & beverage managers estimate demand, while restaurant staff observe trays and refill them when they appear empty (Papargyropoulou et al., 2019). This model is built upon flexibility and previous experience. However, it does not mean there is always a direct relationship between visual expectation and actual demand. Sometimes a tray itself may look empty from a service-quality perspective, but there may be no need to refill it given the circumstances like proximity to the end of the breakfast. In result, the hotel contributes to food waste in order to preserve the impression of abundance.

AI-guided buffet replenishment is the weak signal explored in this scenario. This is a combination of systems that observe buffet trays in real time, analyse information and support staff in decision-making. There is no goal of substituting people with robots, but rather creating an adaptive system with the focus on food freshness, availability and waste prevention.

Fully adaptive AI-guided buffet systems do not currently exist in hospitality. However, several enabling technologies are already being used separately. Such technologies like AI food waste tracking systems, smart inventory monitoring, demand forecasting, and operational dashboards are increasingly used in professional kitchens (Hunter, 2025; Orbisk, 2025). The scenario, therefore, represents a cluster of weak signals that support AI-supported buffet replenishment systems.

The following scenario illustrates how AI-guided buffet replenishment could evolve in the mid term. It does not describe a fully established industry standard, but a plausible future development based on currently emerging technologies in AI-supported food waste management, demand forecasting, and smart operational infrastructure.

Source: Open AI, 2026

SCENARIO: A BUFFET THAT THINKS AHEAD

It is June 2030. A Sunday morning. **7:00 am.** A glorious sunny morning begins on the largest island in Germany - Rügen. The first guests are already making their way across the hotel grounds. A couple returns from an early swim in the Baltic Sea, while a group of Norwegian cyclists prepares for a long ride along the coast, hoping to avoid the midday heat. Families are beginning to gather on the terrace, looking forward to a relaxed breakfast overlooking the water.

At first glance, nothing seems unusual. Fresh bread rolls, croissants, cheeses, fruit, yoghurt, juices, and a pancake station are neatly arranged across the buffet. Staff are welcoming arriving guests with coffee and smiles. The atmosphere feels calm. Yet everyone working at the hotels knows that mornings like this used to be the most demanding part of the day.

Breakfast service was never difficult because of cooking. It was difficult because of coordination. Within less than two hours, several hundred individual decisions had to be made. Should another tray of scrambled eggs already be prepared? Was someone monitoring the juice station? Were more bread rolls needed, or would they become waste? Was the fruit station running low because many guests had just arrived or because several children had filled large bowls at once?

No single employee could have an overview of the whole buffet operation. Kitchen staff, buffet attendants, and service staff exchanged information continuously to coordinate the replenishment and necessary activities, but due to the high amount of work, everyone received only some fragmented information. As a result, during the most busy periods, two stations could have been refilled twice, but another station was neglected. Besides, in order to avoid guests' dissatisfaction, food was prepared in abundance as a precaution. This led to unnecessary overproduction and food waste, not to mention operational stress.

Guests gradually fill the terrace overlooking the Baltic Sea. Families, couples, and cyclists move between the buffet and their tables while the smell of freshly brewed coffee drifts through the morning air. At first glance, nothing appears unusual. The buffet looks exactly as guests would expect: fresh pastries, fruit, juices, cheeses, and warm breakfast dishes laid out to create a generous and inviting experience. There are no visible robots. The real innovation operates quietly in the background.

Source: Open AI, 2026

Tiny cameras and sensors above the stations monitor the amount of food on display (Hunter, 2025; Orbisk, 2025). Small trays below each buffet station with built-in scale measure how quickly items disappear (Marriott, 2024; Nadwani, 2025). The orange juice dispenser monitors the consumption speed. The pancake station tracks not only how much dough is left, but also how many portions are likely to be needed in the next 30 minutes.

Behind the buffet, without disturbing the guests, the hotel's AI replenishment system is already working. The hotel's booking data from Property Management System like number of guests, the weather conditions, the day of the week, the historical patterns, the waste from the previous weekend (Sigala et al., 2025) has already been taken into account (Oxmaint, 2026). It knows that cloudless warm Sundays on Rügen are different from the rest of the days: tourists usually come earlier to enjoy the morning sun, take lighter food like cereals with yoghurts and fresh juices, and enjoy their time on the terrace. However, cycling groups require more filling and a much faster breakfast, as they have an important competition with the sun ahead of them (Shankaran, 2026).

7:37. The Norwegians are already seated at their table under the pines. The system has detected that the consumption of bread rolls, cheese, and boiled eggs is faster than usual. Based on the previous data, the group will not stay long, and there are no more cycling groups expected this morning. There is no need to refill any stations just now.

8:06. The system notices that pancake dough is starting to run lower. Not surprisingly, the hotel has a larger number of families with children, and pancakes have always been preferred on lazy weekends. However, no one is running to refill the station: the system analyses the consumption speed, the number of guests already seated, as well as the expected guest arrivals in the next hour (Hunter, 2025).

A small notification appears on the kitchen dashboard (Flexkeeping.com, 2026):

Pancake station: high demand, additional medium batch is needed, reassessment in 20 minutes.

A staff member confirms the suggestion and starts preparing the dough. No panic, no guessing. The guests will continue enjoying fresh pancakes without any delays.

8:28. The sun is higher above the Baltic Sea, the terrace is almost full, and the guests are staying longer than expected. The orange juice carafe is almost empty, the fruit station is running low. The system observes an unexpected pattern and notifies the staff:

Fruit and juice demand above forecast, refill required.

Source: Open AI, 2026

The breakfast manager glances at the alert and smiles. Yes, this is the kind of behaviour he would have expected on sunny mornings: guests prefer fresh and cold items instead of warm and heavier dishes usually popular on rainy days. The staff knows this from experience, but the system makes this pattern visible and measurable.

8:41. The scrambled egg station has fallen below 35 percent capacity. In a traditional buffet, a buffet employee would have already triggered a refill. However, the situation is different for an AI-replenishment system. The first breakfast wave is beginning to slow down, most families are already finishing their breakfast with the warm food. It is expected that fresh fruit and yoghurt will be in demand in the next hour. There is also a pattern that when scrambled eggs are refilled after 8:45, it often creates leftovers.

The recommendation appears in the kitchen:

Scrambled eggs below 35 percent, low demand expected, small batch is required.

This is the main change: the buffet replenishment is no longer driven by visual logic. The question is no longer whether the tray is empty, but rather whether it is still meaningful to refill it considering time, guest flow, waste, and historical data (Shankaran, 2026).

9:15. Breakfast is still busy, but the atmosphere is very different from previous years. There is no rushing among the staff to check every buffet station. Instead, they are driven by received signals. Someone adjusts the fruit trays, someone is bringing additional cups for the coffee station, someone is helping guests at the pancake station. The AI system has not replaced or removed the human touch. It actually gives staff more time to stay present, to interact with guests, and create a personal bond with them.

Unlike traditional buffet management, the adaptive system does not treat every refill equally. Instead, replenishment decisions are prioritised according to expected demand, service duration, and waste probability. This reduces unnecessary overproduction while allowing staff to focus on guest interaction and service quality rather than repetitive monitoring tasks. In this sense, AI changes not only buffet logistics, but also the operational role of hospitality employees.

9:45. The pastry station still contains a variety of products, but from a visual perspective it looks less abundant. Another message appears in the kitchen:

Pastry station at 30 percent, change presentation to smaller plate.

Source: Open AI, 2026

Instead of adding another tray that could potentially end up in the waste, the staff maintains visual quality by putting the rest of the items on a smaller tray. The station still looks attractive, but no necessary new batch is prepared.

10:30. Breakfast service ends. The cycling group is nearing Cap Arcona, and the couple who went swimming have returned for a warm coffee. The staff begins to clear the buffet, but the amount of leftovers is significantly lower compared to previous years.

The AI-replenishment system is still working: it compares the morning forecast with the actual consumptions, identifies patterns, and records the decisions (Oxmaint, 2026). This data will turn into tomorrow's forecast, preparation for next sunny Sunday morning, and purchase decisions. The buffet gradually becomes a learning system that improves with every service cycle.

This scenario showcases that innovation is not just the replacement of human elements by AI, sensors, or robots. It is about the change in how the system operates. A traditional buffet is based on the concept of abundance: food should be visibly available. However, the adaptive buffet is about managing replenishments based on real-time demand. There is still a variety of items available for consumption, but without overproduction.

The hospitality element is not removed from the breakfast buffet service: guests are enjoying the sea view, fresh pancakes, warm coffee, and a generous breakfast. But behind the scenes, it is no longer created through excess, but through gathered data, timing, and intelligent coordination. In larger hospitality environments, some hotels may additionally integrate autonomous service robots or mobile inventory-scanning units to support buffet monitoring and kitchen logistics.

It is still human, but supported with modern technology.

Source: Open AI, 2026

Discussion

Strategic implications

The scenario outlined in this paper suggests that AI-guided buffet replenishment is not a single, futuristic technology but a combination of weak signals that are already partially mature on their own: waste tracking, demand forecasting, and IoT-enabled monitoring. Brought together, these carry real strategic implications for hospitality businesses, both in terms of competitive advantage and the resources required to actualise it.

This advantage, however, is not evenly distributed across the technologies identified in this paper's trend radar. Waste tracking and demand forecasting are already classified as 'Late Developing', meaning hotels can realistically capture most of the associated cost benefit in the near term, using commercially available tools. IoT-enabled buffet monitoring and context-aware replenishment, however remain 'Emerging'. The strategic case for these components is therefore more speculative. It, moreover, depends on technological maturation that has not yet fully occurred.

The clearest advantage lays in cost efficiency. As demonstrated by Sigala et al. (2025), AI-based waste-tracking systems have already cut food waste by up to 51% and cost reductions of up to 39% per meal in real hospitality settings. For hotels operating on tight F&B margins, particularly on high-volume breakfast operations, this is not a marginal improvement but a structural shift in profitability. Moreover, a less direct, but arguably just as important, benefit around sustainability is visible. It is no longer purely a compliance box to tick: corporate travel buyers, certification bodies, and a growing number of leisure guests now weigh sustainability credentials when choosing where to stay (HRS, 2025; Ethos, 2026). A hotel that can point to measurable, data-backed waste reduction, rather than just claiming "to care about sustainability", is in a stronger position for both ESG reporting and for building that into its brand story.

A further, less obvious advantage relates to the guest experience itself. In the scenario developed for this paper, AI-guided replenishment does not require visibly reducing abundance, instead it reshapes how abundance is presented. For instance, through smaller-batch replenishments or adjusted presentation at low-traffic stations. While this remains a hypothetical illustration rather than empirically observed outcome, it is consistent with how Appel, Ayalon and Collins-Kreiner (2025) describe hotel managers' efforts to balance visual generosity against waste reduction in real operations. This suggests that, if implemented carefully, AI-driven buffet management could in principle preserve or even enhance the guest's perception of generosity while reducing the operational waste behind it. Hereby it is important to mention, this would need to be tested in practice before such a claim could be made with confidence, particularly given that the previous sections already identified guests perception of abundance as one of the central risks of over-optimised buffet management. The scenario in this paper should therefore be read as a plausible resolution to that tension, not as proof that it is easily resolved.

These advantages in any case are not free. Realising them requires investment across several type of resources. Hardware investment is needed for sensors, smart scales an camera-based monitoring at buffet stations. Software integration is required to connect these inputs with existing Property Management Systems (PMS) and Point of Sale (POS) data, since the value of AI forecasting depends on the quality and breadth of the data it can draw on.

Source: Open AI, 2026

At this point it is important to highlight that this is not necessarily a trivial step, as some legacy PMS platforms that were not originally designed for this kind of integration, lacking the open APIs or data-export capabilities that AI-driven systems typically require. In such cases the underlying systems may first need to be upgraded or replaced before any meaningful AI integration becomes possible, adding further layer of cost and complexity beyond the AI tool itself. Moreover, human resources are equally important: hotels need either in-house capabilities or a vendor partnership to interpret system outputs and translate them into operational decisions, alongside dedicated time for staff training. Without these complementary investments, the technology alone will not generate the strategic advantage outlined above.

Diffusion of innovation: Likely Early Adopters

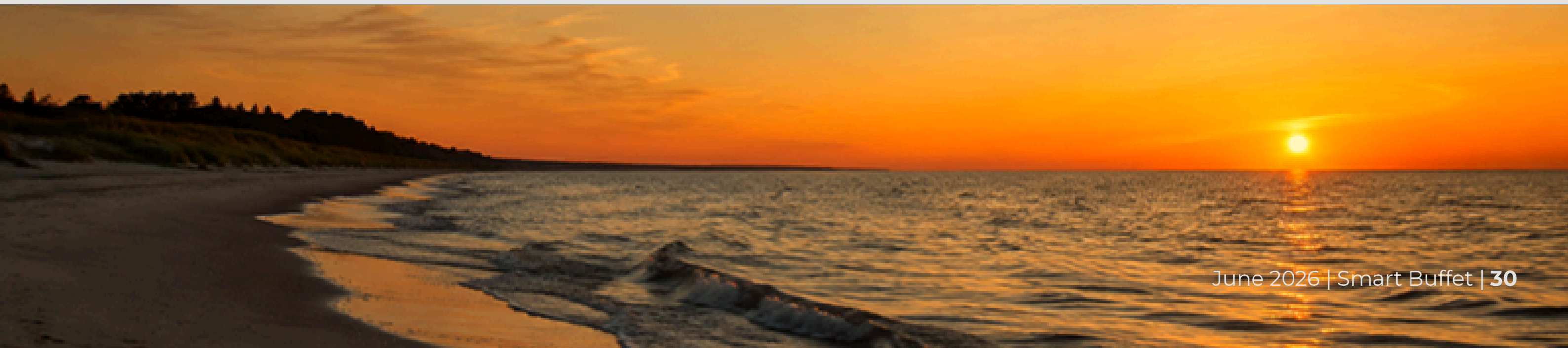
Applying a diffusion-of-innovation leans helps clarify which types of hospitality organisations are most likely to adopt AI-guided buffet management first, and which are likely to follow later. The pattern is closely tied to the maturity classifications established in the Methodology section. Technologies already ‘Late Developing’ or ‘Mature’ are lower-risk entry points, while Emerging technologies are more likely to be adopted only by organisations willing to absorb pilot-stage uncertainty.

Large international hotel chains are a plausible early adopter category, mainly because they have capital reserves to absorb pilot costs and face real pressure from investors and corporate clients to show measurable sustainability performance. The adoption numbers support this in terms of breadth: close to 80% of hotel chains now report using AI in some form, compared to 41% of independent hotels (Cloudbeds, 2026). Marriot illustrates what this can look like in practice, having already piloted AI-based food waste tracking through Winnow, while continuing to invest in broader technology modernisation across its property systems (Hoteltechnologynews, 2026).

This is exactly the kind of infrastructure a single independent hotel would struggle to justify on its own. That said, having the resources to fund something is not the same as rolling it out quickly. Several industry reports suggest large chains are often slowed by legacy systems and get stuck at the pilot stage, while independent hotels tend to move faster once they commit, simply because they have less existing infrastructure to work around (Hotel Dive, 2025). Hotel chains, then, may be better positioned to fund and justify AI-guided buffet replenishment, but not necessarily to deploy it fastest, a distinction worth keeping in mind when applying a diffusion-of-innovation lens here.

Independent and boutique hotels, as used in the paper's own scenario, are more likely to represent the early or late majority rather than the innovators here. For these properties, the upfront cost of sensor infrastructure and system integration is harder to justify against an uncertain return, particularly where revenue is seasonal. Adoption among this group will likely depend on subscription-based vendor models becoming more widely available, where AI-guided replenishment is offered as a service rather than a large capital investment, lowering the barrier to entry for single-property operators. Moreover, regulations may also push adoption faster than either capital or speed arguments alone would suggest. Where food waste legislation or municipal fines are already in place, hotels of any size an be pressured in adopting AI-based tracking and replenishment systems sooner than a pure cost-benefit calculation would predict, as seen with the uptake of tools such as Pancho among hotels in Spain (Hunter, 2025) see Trend Radar. Taken together, these patterns suggest that the case hotel used in the paper's scenario would most plausibly sit among the later adopters: well resourced enough to benefit from AI-guided replenishment in principle, but unlikely to be among the first movers without either a strong regulatory push or the emergency of lower-cost, subscription-based entry points. This has direct implications for the barriers discussed in the following section.

Source: Open AI, 2026



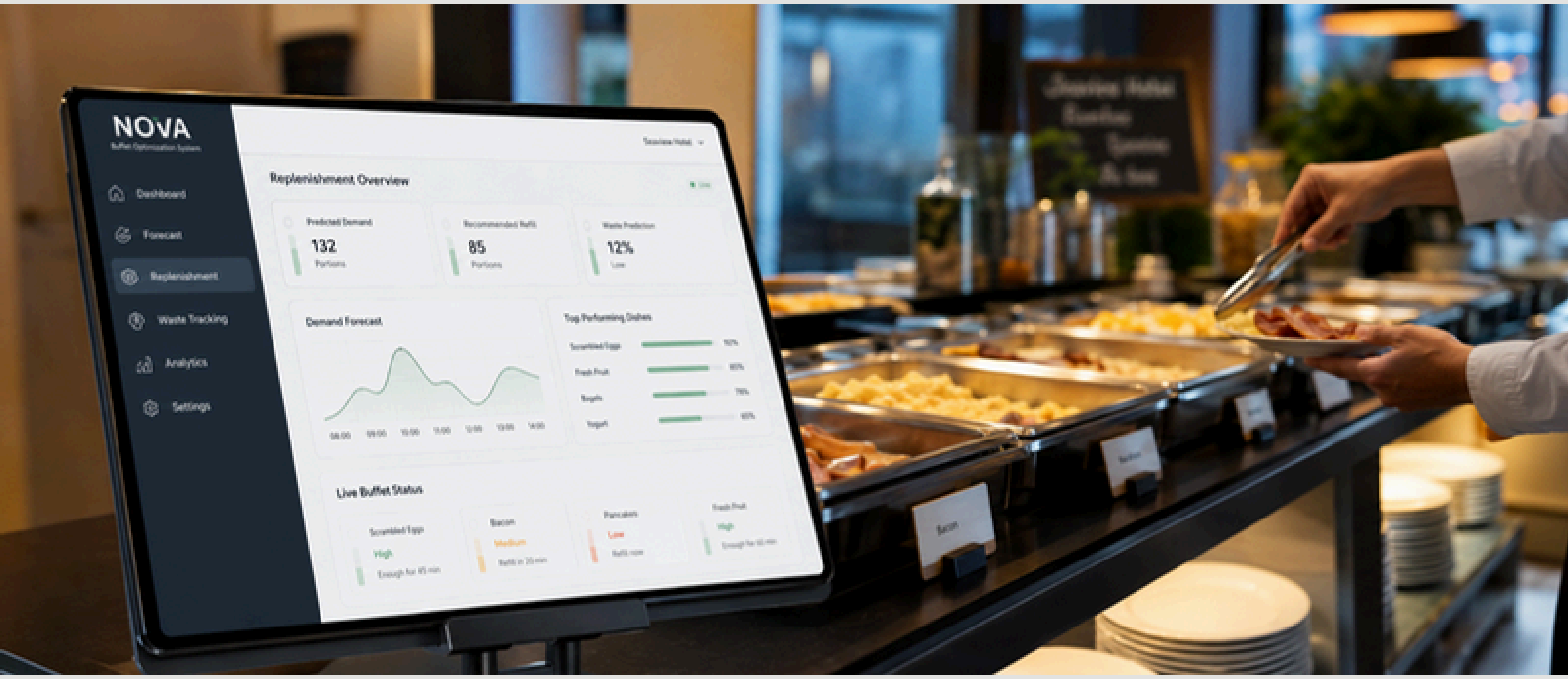
BARRIERS TO ADOPTION

Despite several opportunities, several barriers are likely to slow adoption, and most of them were already hinted at in the previous sections. They are worth picking up again here in more practical terms. Cost and ROI uncertainty remain the most obvious obstacle especially for the kind of independent property discussed above. Without clear payback benchmarks specific to buffet replenishment, it is hard for a smaller hotel to justify the investment internally, even if the long-term case is sound. Leasing or subscription-based vendor models, rather than upfront purchases, are the most realistic way around this. Additionally, system integration is a second, closely related to barrier, regarding legacy PMS platforms. Where systems were not built to interface with AI tools, hotels may need to budget for upgrades before any forecasting or replenishment software can even be connected. Starting with a single buffet station rather than the whole operation is one way to limit this risk early on.

Staff resistance is a further issue worth taking seriously. As Ivanov and Webster (2019) point out, automation tends to be accepted more easily when it is framed as support rather than surveillance. If staff feel monitored rather than assisted, resistance is likely, regardless of how well the technology actually performs. This is less a technology problem than a communication one. Data privacy and bias concern add another layer, particularly around guest-segment data. As flagged in the trend radar, using categories such as nationality or cultural background for demand prediction risks reinforcing stereotypes and creating GDPR compliance issues (Dwivedi et al., 2021). Framing segmentation around behaviour and booking history instead of demographic categories is a more defensible approach, and one that is still possible to build in now, given that this part of the technology is still only ‘Emerging’.

Finally, guest perception remains the structural tension running through this whole discussion. As outlined before , buffet abundance has long signalled quality and generosity (Kallbekken and Saelen, 2013),   so visibly leaner-looking stations could undermine guest experience even where actual food availability is unaffected. The scenario's smaller-plate approach offers one possible solution, but as already noted, this remains untested rather than proven.

Source: Open AI, 2026



Conclusion

This paper examined how AI-guided buffet replenishments as a weak signal with real potential to reshape how hotel breakfast operations are managed over the mid-term. The analysis was not intended as a warning against risky technology, nor as unconditional enthusiasm for it, but rather as an honest attempt to map where this is heading and what it would actually take to get there.

The central argument is straightforward: AI does not need to replace the hospitality core of buffet service to add value. It changes how that service is delivered behind the scenes, shifting from visual abundance and gut instinct towards real-time data, timing and smarter coordination, while keeping the guest experience largely intact. The scenario developed for this paper illustrates one plausible version of that future, grounded in technologies that are already partially in use today. What the scenario also showed, and what the discussion above reinforces, is that the path from where the industry currently sits to that future is not automatic. It depends on hotels treating adoption as a staged process, one that is honest about cost, realistic about infrastructure constraints, and genuinely attentive to the human side of implementation, both for staff and for guests.

The primary audience for these findings is hotel general managers, F&B directors, and sustainability or innovation leads within hospitality groups. Those, with the operational authority to evaluate whether a pilot makes sense for their property. However, the implications extend beyond hotel operators alone. Technology developers and start-ups working on AI-driven food service tools represent an equally relevant audience: the gap between what currently exists, largely separates tools for waste tracking, forecasting and monitoring. What the scenario describes as a fully integrated replenishment system, is precisely the product space that remains open for development, In this sense, this paper is as much a signal for innovators building the next generation of hospitality tools, as it is for the hotels that will eventually adopt them.

For both audiences, the core takeaway is the same. AI-guided buffet management is not a plug-and-play solution. Its value depends on how it is implemented, whether staff understand and trust it, whether the underlying data infrastructure is in place, and whether hotels are willing to pilot and adjust rather than expecting immediate results. The organisational and technical conditions for success will matter just as much as the tools themselves.

References

Appel, G., Ayalon, O., and Collins-Kreiner, N. (2025) 'From a full buffet to a full bin – hotel managers' perspectives on food waste at breakfast buffets', International Journal of Hospitality Management, 130, pp. 1-10. https://doi.org/10.1016/j.ijhm.2025.104276.

Buhalis, D., and Leung, R. (2018) 'Smart hospitality: Interconnectivity and interoperability towards an ecosystem', International Journal of Hospitality Management, 71, pp. 41–50. https://doi.org/10.1016/j.ijhm.2017.11.011.

Cloudbeds (2026) 2026 State of Independent Hotels Report. San Diego, CA: Cloudbeds. Available at: https://www.cloudbeds.com/hospitality-industry-report/ (Accessed: 1 July 2026).

Ethos (2026) The eco hotel is now everyone's hotel: 30% of travelers booked certified sustainable stays in 2025. Available at: https://the-ethos.co/30-percent-of-travelers-booked-certified-sustainable-stays-in-2025/ (Accessed: 23 June 2026).

Filimonau, V. et al. (2019) 'The determinants of consumer engagement in restaurant food waste mitigation in Poland: An exploratory study', Journal of Cleaner Production, 247, p. 119105. https://doi.org/10.1016/j.jclepro.2019.119105.

Flexkeeping (2026) Hotel Task Management Software. Available at: https://flexkeeping.com/capabilities/hotel-task-management-software (Accessed: 1 July 2026).

Garcia, M. (2025) 'Hotel chains struggle with AI strategy, independents see fast ROI', PhocusWire, 3 October. Available at: https://www.phocuswire.com (Accessed: 29 June 2026).

Hiltunen, E. (2008) 'The future sign and its three dimensions', Futures, 40(3), pp. 247–260. https://doi.org/10.1016/j.futures.2007.08.021.

HRS (2025) State of Sustainability in Corporate Travel: Green Stay Initiative. November 2025.

HotelTechReport (2026) 2026 Hotel PMS Report: What Elite Operators Want, Use, and Plan Next. Available at: https://hoteltechreport.com (Accessed: 29th June 2026).

Hunter, S. (2025) 'Meet Pancho, the AI bot fighting food waste at the hotel buffet', The Times. Available at: https://www.thetimes.com/uk/environment/article/meet-pancho-the-ai-bot-fighting-food-waste-at-the-hotel-buffet-9fwf73mbd (Accessed: 1 July 2026).

Ivanov, S., and Webster, C. (2019) 'Conceptual framework of the use of robots, artificial intelligence, and service automation in travel, tourism, and hospitality companies', in Ivanov, S., and Webster, C. (eds.) Robots, Artificial Intelligence, and Service Automation in Travel, Tourism and Hospitality. Bingley: Emerald Publishing, pp. 7–37.

Kallbekken, S., and Sælen, H. (2013) '“Nudging” hotel guests to reduce food waste as a win–win environmental measure', Economics Letters, 119(3), pp. 325–327. https://doi.org/10.1016/j.econlet.2013.03.019.

Marriott (2024) AI Monitoring Helps Marriott Hotels to Slash Food Waste. Available at: https://www.hotelnewsresource.com/article133469.html (Accessed: 1 July 2026).

Nandwani, D. (2025) 'The intelligent pantry: How hotel kitchens are leveraging AI', Soul of Hospitality. Available at: https://www.soulofhospitality.com/dine-drink/trends/the-intelligent-pantry-how-hotel-kitchens-are-leveraging-ai (Accessed: 1 July 2026).

Orbisk (2025) Reduce Food Waste in Your Hotel. Available at: https://orbisk.com/hotels/ (Accessed: 1 July 2026).

Oxmaint (2026) AI Food Waste Reduction for Hotel Restaurants & Catering. Available at: https://oxmaint.com/industries/hospitality/ai-food-waste-reduction-hotel-restaurants (Accessed: 1 July 2026).

Papargyropoulou, E., Steinberger, J.K., Wright, N., Lozano, R., Padfield, R., and Ujang, Z. (2019) 'Patterns and causes of food waste in the hospitality and food service sector: Food waste prevention insights from Malaysia', Sustainability, 11(21), p. 6016. https://doi.org/10.3390/su11216016.

Puga-Gonzalez, I. et al. (2025) 'To eat or not to eat: Modeling food waste behavior at a hotel breakfast buffet', Cleaner and Responsible Consumption, 19, pp. 1–13. https://doi.org/10.1016/j.clrc.2025.100333.

RapidEye (2026) Which Hotel PMS Platforms Have Open APIs (and Which Are AI-Ready)? 2026 Scorecard. Available at: https://rapideyeinspections.com (Accessed: 30th June 2026).

Rohrbeck, R., Battistella, C., and Huizingh, E. (2015) 'Corporate foresight: An emerging field with a rich tradition', Technological Forecasting and Social Change, 101, pp. 1–9. https://doi.org/10.1016/j.techfore.2015.11.002.

Shankaran, S. (2026) 'AI agents for real-time demand sensing and predictive commerce', Callsphere AI. Available at: https://callsphere.ai/blog/agentic-ai-demand-sensing-predictive-commerce (Accessed: 1 July 2026).

Sigala, E.G. et al. (2025) 'Reducing food waste in the HORECA sector using AI-based waste-tracking devices', Waste Management, 198, pp. 77–86. https://doi.org/10.1016/j.wasman.2025.02.044.

Stone, D. (2026) 'Choice Hotels moves AI technology beyond pilot projects and into the core of hotel operations', Hotel Technology News, 25 April. Available at: https://hoteltechnologynews.com (Accessed: 1 July 2026).

Tussyadiah, I. (2020) 'A review of research into automation in tourism: Launching the Annals of Tourism Research curated collection on artificial intelligence and robotics in tourism', Annals of Tourism Research, 81, pp. 1-15. https://doi.org/10.1016/j.annals.2020.102883.

United Nations Environment Programme (UNEP) (2024a) Food Waste Index Report 2024. Nairobi: United Nations Environment Programme. Available at: https://wedocs.unep.org/items/dbe2cd4c-8384-4636-8359-5847f42b9711 (Accessed: 8 June 2026).

United Nations Environment Programme (UNEP) (2024b) World squanders over 1 billion meals a day – UN report. Available at: https://www.unep.org/news-and-stories/press-release/world-squanders-over-1-billion-meals-day-un-report (Accessed: 1 July 2026).

Source: Open AI, 2026