# The Impact of Robotics in Hospitality Industry

**Indranil Chowdhury[1] Subrata Pal[2]**

[1]*Assistant Director – Amity School of Hospitality, Kolkata, West Bengal*

[2]*NSHM Academy, Durgapur, West Bengal*

## Abstract

The study from 1984 that pushed hospitality educators to incorporate robots into their classes and research is revisited, updated, and summarised in this conceptual research note. Organizations across the world are beginning to use robots, artificial intelligence, and service automation in a variety of ways. The tourism and hospitality sectors are embracing cutting-edge technology. Travel firms have the ideal chance to improve marketing, customer service, customer experience, and retention thanks to AI. Artificial intelligence (AI) has the potential to provide travel agencies and hoteliers with priceless insights they have never had before. This thesis contrasts the existing situation with the possibilities for the future through an update of service design techniques. It does this by outlining the application of RAISA in hotel SPD through a literature study. It is advised that there may be benefits and drawbacks to adopting robots in the hotel sector.

*Key words : Robotics, Hospitality, Tourism industry*

## Introduction

Service-related industries have started utilising IT to interact with customers more easily and quickly than in the past as information technology (IT) has developed and expanded throughout various disciplines. Businesses have expanded their use of IT as it improves transactions, and the volume of IT transactions has gradually increased. Self-service technologies (SSTs) are among the most recent technological advances that many industries have actively adopted. Because clients may execute transactions through SST interfaces without the aid of service providers, the emergence of SSTs has resulted in significant developments. SSK technology is still relatively new to the hotel sector. Major U.S. hotel companies including Marriott, Hyatt, and Hilton started using SSKs since they were used in the retail and aviation industries. Understanding how customers view SSTs has become crucial for solving this problem. CS has a direct impact on client retention, client loyalty, and ultimately a company's profitability.

Robots have already begun to appear, and they will remain prevalent for a while. The globe has seen major advancements in robotics, artificial intelligence, and service automation in recent years (Kanda and Ishiguro, 2012; Russell and Norvig, 2010; Samani,2016). According to Ivanov, Webster, and Berezina (2017), the hospitality sector is seeing an increase in the use of service robots as a result of recent technical advancements. For instance, Hilton announced the creation of the world's first robot concierge in partnership with IBM (Hilton, 2016). For more complicated tasks like making hotel and travel reservations, robots are deployed. The first hotel to deploy a robot system for guest interaction was the Henn-na Hotel in Japan,

which provided front desk, storage, and check-in/check-out services. Robotics utilisation has ushered in a new era for hotels and airports. The goals of robots and artificial intelligence, according to Chinese e-commerce behemoth Alibaba, are to increase productivity and reduce labour costs. One of the main reasons why the hospitality industry is embracing the usage of robots is that they are safer to employ when lifting heavy gear and sharp materials, and if they are hurt or broken, they are less expensive to fix than going to the hospital. Robots can execute human tasks more successfully than humans because they never grow tired. They do not need a pay or a holiday, so the constancy of their work and the maximum of their earnings as a consequence of the happiness of their customers and guests. It is crucial to note that using robots in the hospitality industry does not always result in more unemployment for people; rather, it encourages staff to work regularly, which raises productivity. This essay elaborates on the significance of robots in the hotel industry. The two goals of this review are to highlight the working relationships between robotics and people and how they contribute to the development of the hospitality business, as well as to examine the significance of the use of robots in the hospitality sector in terms of increased productivity. The study also attempts to provide recommendations for future academic endeavours for students majoring in hospitality with several research issues. Why should academics in tourism and hospitality concerned about a science fiction phenomenon that a lot of people believe to be a minor aspect of the current economy? The exponential increase in the cost-effectiveness of information technology is emphasised in The Second Machine Age (Brynjolfsson, McAfee, & Cummings, 2014). If Moore's Law holds true, the capabilities of today's robots will double around every two years. Breakthroughs in sensing, actuator, and power technologies could lead to a boom in robotics. According to a 1984 study (Andrew), hospitality educators should think about technology, especially robots, in their classrooms and look at how they will affect consumer acceptance, the workplace, management education, facility design, and the bottom line. AI uses cognitive learning to perform typical human tasks with significantly lower costs, greater efficiency, and less errors. IDC- Worldwide Hospitality Travel's 2018 estimates state that by 2019, 60% of hotels and 70% of online travel agencies would have embraced artificial intelligence (AI). This will result in a 30% increase in clients. In the next three to five years, 52% of airlines and 45% of airports expect to invest in significant AI/ML-based projects, according to SITA's 2017 Air Transport IIT Trends Insights study.

Although visitors leave a digital footprint in a variety of locations, including restaurants, leisure centres, airlines, stores, at events, on social media, and more, it is still possible to use this useful information to determine visitor preferences and develop new revenue streams. Robots and humanoids are already being used in the travel and hospitality sector as receptionists and tour guides at hotels and airports, which is how AI is being applied in this sector.

In the UK and other nations, the early 2020 coronavirus pandemic has resulted due to the government-imposed lockdown, several hotel companies have been forced to close or operate with extremely less client bases of important employees or long-term residents., creating new and serious challenges for the industry. The safety of guests and employees is of the utmost concern as hotel operators prepare to reopen as of the time of writing (Emmanueilli et al. 2020, Buhalis 2020). Customers' worries include the expectation of higher standards of sanitation and cleanliness upon reopening with social segregation policies in place, as well as with clear messaging to assist establish confidence, while they attempt to picture new or modified business models (Krishnan et al. 2020). (Berg et al. 2020, Partridge 2020). According to Webrezpro 2020, Emmanueilli et al. 2020, Mintel 2020, and Partridge 2020, these demands are forcing managers to consider

service design that minimises customer-employee interactions, reduces physical touchpoints, and reduces service capacity (for instance, in restaurants with fewer tables occupied and with bedrooms removed from inventory for periods between stays) (Pflum 2020, Partridge 2020). At the same time, however, they are also increasing cleaning and hygiene standards and routines (Buhalis 2020, Hardiman 2020). In terms of the adoption of new technologies and their potential applications, the development of these "new normal" operating models, or at least a choice between them and more traditional ones, as well as the growing acceptance of the need for rapid technological adoption, reinforce the thesis' urgent contemporary relevance (Seyitolu and Ivanov 2020, Ivanov et al. 2020b, Mintel 2020). The pandemic's emergence at the end of the research period led to the formation of relevant conclusions, which are only briefly discussed throughout Chapter Seven.

**Brief literature review**

It's been nearly a century since the term "robot" first appeared in the play Rossum's Universal Robots (Czech karelCapeks, 2001). The term robot was derived from the Czech word robota, which means "forced labour." They used the term automation in the 1950s, but with Czech Karel Capek's satire, the name robot began to be used in films, radios, and television, such as the lonely episode of the television series (1959). The robotic revolution began in the 1950s, when George Devol built the first digitally controlled and programmable robot, Unimate (1954). This, however, lay the groundwork for current robotics industry (Mary Bellis, 2018). Everywhere, commercial and industrial robots are being employed to execute duties more cheaply, accurately, and reliably than people. Some professions are too risky, boring, or dirty for people, so robots should be used instead. Automation refers to the use of machinery to execute a reprogrammable sequence of tasks in service delivery. Self-service check-in kiosks in airports, for example, allow customers to save time and get to the gate faster, improving customer experience. Customers may use the no wait mobile application to monitor waiting times at neighbouring restaurants, get on the waiting list remotely, track how many parties are ahead of them, and arrive at the restaurant at the proper moment to be seated to ensure a pleasant dining experience (Perez, 2014). Apparently, robotics applications abound in manufacturing, both inside and outside the home, medicine, entertainment, military and law enforcement, and a variety of other applicants. The hotel and tourist sectors have recognised the usage of professional service robots as an essential element of the service business. Service automation and robotic technologies are used in the lodging industry and have an impact on several aspects of hotel operations.

The hotel Henn-na (Japan) was the first to employ robots and aims for maximum efficiency. It has robotic front desk agents, porters, in-room help, and vacuum cleaners. Hilton Hotels introduced a robotic concierge driven by artificial intelligence in 2016. (Hilton, 2016). It interacts with hotel guests by offering information on nearby attractions or activities and answering inquiries about facilities.

A Chinese restaurant has transformed customer service by deploying robot waiters to serve meals and beverages (BBC,2014) In Thailand, the Hajime restaurant features robots who collect and deliver orders from customers. The role that automation plays has simplified travellers' experience with robots. Because of the integrated self-service check-in kiosks, service is quick and efficient, and security is assured. The bags would subsequently be transported on automatic belts to the sorting facility and the appropriate plane (Duell, 2014).

The use of robots and other linked systems increased productivity and economic growth (Chris Middleton, 2018). Robotic concepts such as automation and self-service are playing an increasingly important part in the consumer experience. The usage of robots results in increased speed, cost effectiveness, and precision.

## Automation and Human Robot Interaction

Decision-making, which may vary from semi-autonomous to autonomous, and human robot interaction (HRI) are two crucial robotic elements. Autonomy is a two-edged sword since it enables human-robot relationships like awareness, trust, and acceptance. Users may feel alone if robots are in charge. Fully autonomous robots have been a goal "since the field's beginnings, both in product development and science fiction. The ideal robot would have machine-like speed and accuracy, adhere to social norms, yet still have human traits like empathy. Humans may, paradoxically, be unpleasant to robots (Barnett et al., 2014). The service dominating logic, in which the company and the client co-create value, appears to be relevant to HRI. Using value cocreation to understand the changing HRI social context is beneficial.

## Robot Classification

Robots come in a variety of forms, from industrial to professional to personal service robots, each with its own mobility, autonomy, and interaction capabilities. Industrial robots have been used in manufacturing for more than 50 years, performing tasks like welding, machining, assembling, packing, palletizing, transportation, and material handling (Blackman, 2013; Thrun, 2004). These robots may be mobile and work from a fixed platform (Thrun, 2004; Oborn 2011). Industrial robots often lack social interaction, are stationary, and only have a limited amount of autonomy thanks to programming.

In their early stages, service robots are developing much more quickly than industrial robots (Thrun, 2004). Professional service robots operate in difficult-to-reach locations including the ocean, nuclear waste sites, and battlefields (Swinson, 1997; Thrun, 2004). Healthcare (Oborn et al., 2011) and senior care are accessible sectors for professional service robot infiltration (Beer et al., 2012; Blackman, 2013; Flandorfer, 2012). These robots frequently have a mobile rather than a fixed design, are socially interactive, and have some autonomy thanks to teleoperation and programming.

Personal service robots can assist humans and provide entertainment. Robotic devices for the home and yard, like vacuum cleaners and lawn mowers, are well-established market segments (Blackman, 2013; Sung et al., 2008; Vaussard et al., 2014). Robots in hotel lobbys were proposed as an experimental alternative to digital signage in a recent Japanese study (Pan et al., 2015). The mobility, autonomy, and HRI of the three robot categories are all highest in personal service robots.

## Service Process Design

"Describes and prescribes the processes to be followed, as well as how personnel will use or interact with other resources such as materials or equipment in order to deliver the service idea," according to Service Process Design (SPD) (Johnston et al. 2012, p. 193). Therefore, this term will be used to describe each customer-firm touch point's design as well as the many features and variables that go into building the customer journey throughout this thesis. The evolution of 'service research,' as first examined by Dorsch et

al. (2014) and Heinonen et al. (2013a), is now quite diverse (Benoit et al. 2017). Service design, a new discipline that incorporates innovative approaches and technology, has emerged within this subject (Fisk et al. 2018). When Hostack (1982a, 1984) emphasised the advantages of utilising an SB in service design and analysis, she championed and pioneered SPD, which focuses on systematically building services using tangible forms (Kandampully 2007). Patrcio and other (2008), in their discussion of the various service design methods, categorised as coming from service management, and the Service Experience Blueprint (SEB), which aims to incorporate technologically enabled multi-interface services into service design, is suggested as an improvement over the Service Blueprint (SB). A fresh approach to multidisciplinary service design was put up by Patrcio et al. (2011). Multilevel Service Design (MSD), which combines experience integration and the co-creative nature of client encounters. Since then, two further models have been created: the Management and Interaction Design for Service (MINDS) and the Service Design for Value Networks (SD4VN).

**Model of Service Design**

A variety of practical and theoretical tools have been created to aid in the design and evaluation of the service process, which are listed below.

- Customer journey mapping is a method of mapping the series of consumer interaction points during a service or set of services.

- Walk-Through Audits - a technique that might be applied to help evaluate and improve service delivery and, therefore, the client's experience with the service. This is often done by employees, supervisors, or mystery shoppers who pose as customers and conduct an audit based on a list of questions that allow the fictitious consumers to evaluate the level of service they get.

- Emotion Mapping is a simple but effective extension of customer journey mapping that seeks to capture customer feelings (both good and negative) at each point of their journey, allowing the organisation to assess and improve them as needed.

- Customer Experience Analysis may be used as a tool to help organisations review and enhance the multidimensional experience of their customers with their services. It combines the service idea, customer experience, the customer journey touchpoints, and evaluation of each touchpoint, taking into account the messages and feelings that the customer perceives.

- Flowcharts (Kandampully 2007) are graphical representations of systems. They show the progression of events throughout the provision of a service and can link them to the necessary agencies, individuals, and support services. Charts for each service, charts for entire departments, and combinations of these many charts may be used to build an overall SB are all examples of flowcharts that can be constructed and utilised at various levels.

- Service Blueprinting (SB) (Shostack 1982a, Shostack 1984, Shostack 1987) - depicts the many processes that comprise the complete service system in diagrammatic and chronological form, as well as the inter-relationships between those activities. It gives the organisation the ability to visualise, organise, and manage the complete service system. This service design tool will be discussed more below.

- The Service Experience Blueprint (SEB) was introduced as an improvement to the Service Blueprint (SB) in order to start incorporating technology-enabled multi-interface services into service design (Patrcio et al. 2008).. The multidisciplinary strategy, which focuses on the design of multi-interface services, aims to capitalise on the benefits of each channel in order to maximise the entire client experience.

- • The Multilevel Service Design (MSD) method (Patrcio et al. 2011) permits design at three hierarchical levels: developing the organization's service notion, developing its service systems, and designing each individual service encounter. The three levels stand for the value provided to the customer within their environment, alternative options accessible to the business and how they are incorporated, and the actual practise of each individual contact.

- The Management and Interaction Design for Service (MINDS) technique (Teixeira et al. 2017) follows the same three-level structure as MSD. To curate technology-enabled services, it uses both management and interface design views. The management viewpoint is centred on developing new value propositions and improving the customer experience.

- The Service Design for Value Networks (SD4VN) approach was developed to maximise network value (Patrcio et al. 2018). The method offers a process and a number of models to aid in comprehending the behaviours, interactions, and goals of network players. Its objective is to facilitate these network interactions while maintaining balanced centricity.
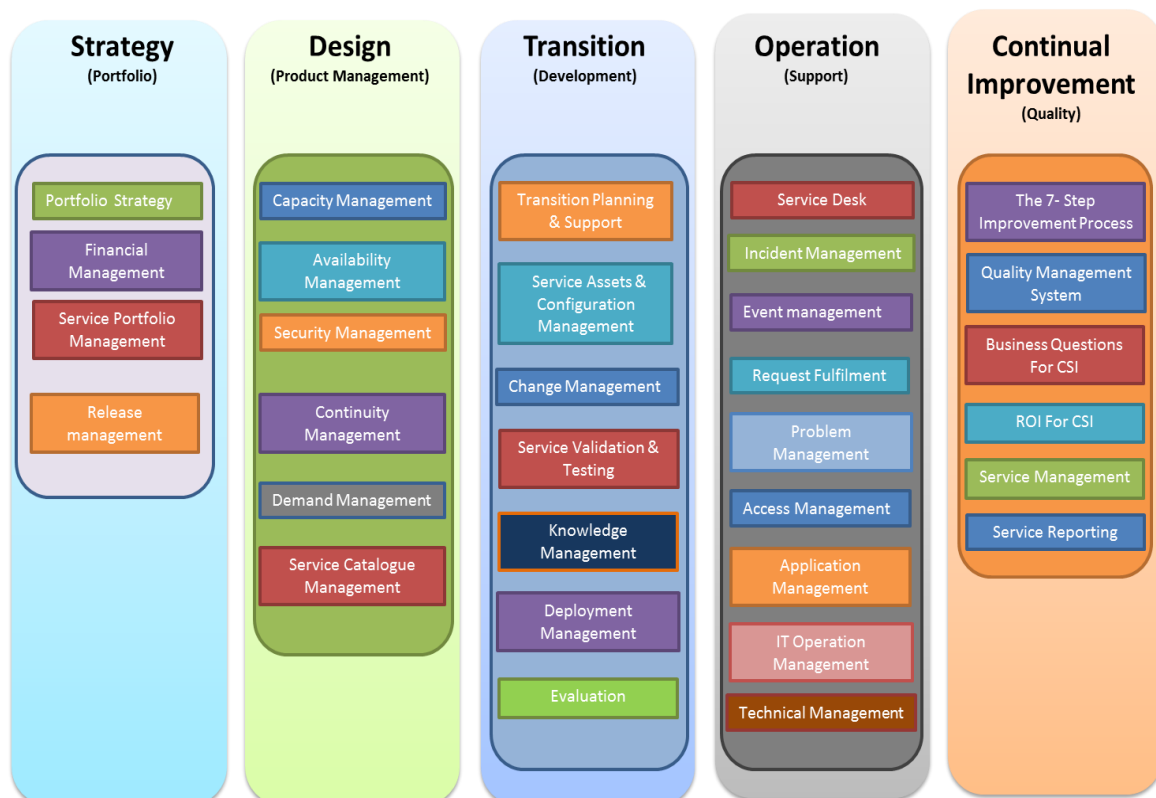


Fig : 1 Source: https://www.interaction-design.org/literature/topics/service-design

## Service Blue Printing

Service Blueprinting, initially introduced by Shostack (1982b), Shostack (1984), and later developed by further research, is the SPD tool with the finest documentation (e.g. Shostack 1987, Bitner et al. 2008, Patrcio et al. 2008). 2017; Teixeira et al. The thesis uses the updated Bitner et al. model and selects the SB as the preferable SPD approach (2008). Because SBs are client-focused, they allow businesses to observe how services are delivered, how customers engage with businesses, and what concrete evidence customers perceive when they get services. As they document and link the behind-the-scenes activities and underlying support procedures, SBs also distinguish between what the consumer sees and what they do not (onstage and backstage activities).

Customer Actions describe each point of contact or engagement between the consumer and the company. 'Invisible Contact/Backstage Employee activities are not visible to customers thus the line of view separates them from onstage activities. These activities include both non-visible involvement (such as phone calls) and tasks carried out by onstage employees behind the scenes to prepare for serving guests. A vital moment occurs each time the line is crossed (when clients interact with service staff)..

The "Support Processes" section makes up the bulk of the blueprint and is separated from the contact personnel by the internal communication line. These are steps made to help deliver the service by non-contact staff (e.g. cooking a meal in a restaurant). At the very top of the plan, the "Physical Evidence" for each consumer activity is mapped. Customers are exposed to these concrete cues at each touchpoint. As it just shows the primary phases in the process, it is regarded as conceptual; more boxes might be added to indicate underlying steps in greater depth.

In this illustration, hotel guests' sequential activities are shown running from left to right in yellow boxes. To identify touchpoints when the customer interacts with either an onstage (or really backstage) contact staff member, directional flow arrows between the customer action and the employee action are employed. Examples include the two-way interaction across the line of contact to make the reservation with a non-visible reservations agent (backstage - marked in orange) and check in with a visible receptionist (onstage - designated in green).

The blueprint for a customer experience in a hotel is laid out in three stages, starting with the creation of the reservation system (coloured green) and ending with the registration system recording the customer's status as checked in. At every stage of the client experience, as illustrated in blue at the top of the blueprint, there is sufficient and obvious concrete proof.
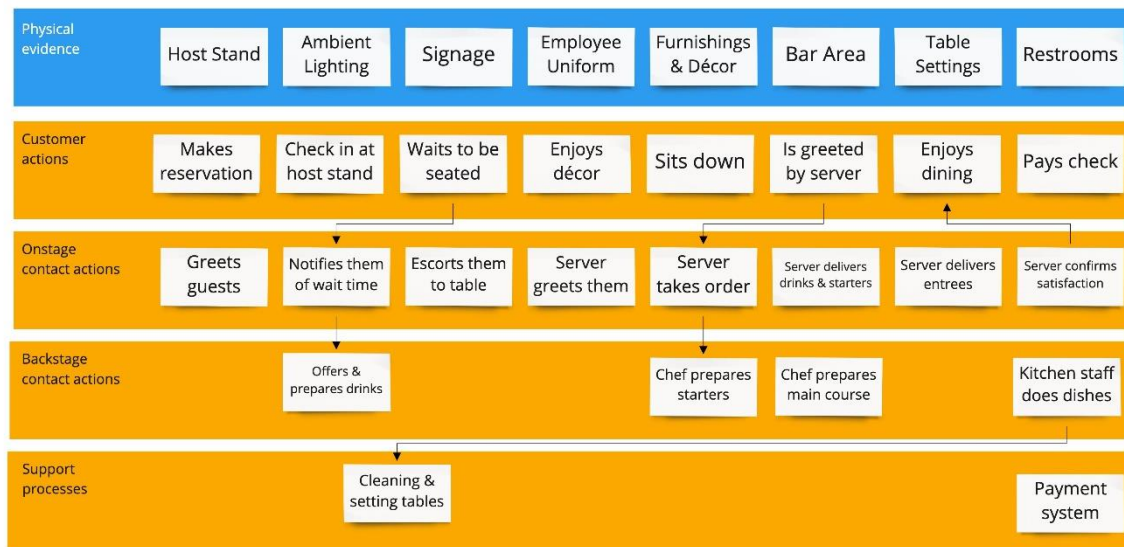
Fig : 2 Source: https://miro.com/guides/service-blueprints/

Advantages and drawbacks of the model are shown via a careful analysis. In light of the theoretical exploration of the SB from an SPD perspective, it is important to note that the model's adaptability and flexibility allow for additional uses. The model could be used at both strategic and operational levels, such as the assessment of current services.

Advantages of Service Printing are in the following ways:

- The technique's relentless customer-focused approach (Bitner et al. 2008)

- enabling businesses to organise, visualise, and control the complete service system (Kandampully 2007) or create a finely tuned version of a single process step (Bitner et al. 2008)

- allowing for the identification of the service's structural components and illuminating and connecting the underlying supporting processes that control and aid in the delivery of customer-focused services (Kandampully 2007). (Bitner et al. 2008)

- letting the organisation choose how services are provided on a functional level (Kandampully 2007)

- encouraging thoughtful decision-making about what consumers see and which staff should interact with them at each crucial time (Bitner et al. 2008)

- enabling a company to test a prototype service, make necessary improvements, and reduce the time and inefficiency of doing nothing (Shostack 1984, Shostack 1982a)

- enabling the systematic evaluation of the service, the identification of failure sites, and the determination of the corrective action required to enhance them (Kandampully 2007, Bitner et al. 2008, Shostack 1984)

- the model's ease of use and accessibility to all organisation members (Bitner et al. 2008) and its clients (Shostack 1987)

- presenting a broad overview of all service systems to help each individual employee or department understand their role in delivering the service (Bitner et al. 2008)

- establishing a constant standard for measuring performance (Shostack 1982a)

Despite the numerous benefits that Service Blueprinting claims to offer, it is important to correctly weigh the restrictions as well because since its inception, service research has tremendously progressed. (e.g., the way value is created: cocreation and the introduction of technology in service). They consist of the following:

- concentrated on analysing a certain service system (Heinonen et al. 2010)

- finished from the organization's viewpoint, the customer playing a passive role and only being partially aware of what the client "does" with the service (Heinonen et al. 2010, Heinonen et al. 2013b)

- According to Patrcio et al. (2008), The introduction of new services via technology is not addressed by the person-to-person mapping of an SB.

- It disregards the collaborative element of the customer experience (Patrcio et al. 2011, for example).

- It ignores the fact that modern services are multi-channel (Patrcio et al. 2008)

- It doesn't take into account the customer's previous use, any pertinent behaviours, experiences, or how they connect to the contested service method (Heinonen et al. 2010)

- may be motivated by particular demands for service encounters or resource effectiveness (Fisk et al. 2018)

- It performs best when it enables the organisation to provide consumers with standardised solutions (Kostopoulos et al. 2012)

- Issues may fall short if consumer preferences and prospective actions are not taken into consideration (Kostopoulos et al. 2012)

Despite more recent models being created to include technology into the service process, there is still a need for an appropriate SPD model that supports the integration of RAISA technologies. The complexity of most modern SPD models and the difficulties stakeholders have in gaining access to them without assistance constitute their third drawback. These three restrictions offer a chance to create a new SPD model.

**Robotics in tourism and hospitality operations: Customer acceptance**

The main robot categories in terms of client acceptance should be personal service robots and slightly professional service robots. Therefore, cocreation of value should have an impact on customer adoption of

robots and reactions to service failure (Barnett et al., 2014; Oborn et al., 2011) and associated HRI (Beer et al., 2012; Belk, 2016; Sung et al., 2008; Thrun, 2004; Wu et al., 2014).

## Robotics' effects on tourism and hospitality industry finances

The usage of service robots at the front of the home and industrial robots in the back has a cost impact. Robotic return on investment (ROI), capital investments, costs, revenues, leasing vs buying, robot maintenance, and depreciation are some of the topics under investigation. The financial sides of robots, especially personal service robots, should also heavily include HRI (Beer et al., 2012; Belk, 2016; Thrun, 2004). What features of HRI, then, will boost the ROI of robotics?

## The impact of robotics on the tourism and hospitality workplace

Industrial robots at the rear of the home and service robots in the front should have workplace consequences, much like financial repercussions. Will robots, for instance, replace certain occupations while creating others? When it comes to personal service robots, HRI will be crucial (Barnett et al., 2014; Belk, 2016; Thrun, 2004; Wu et al., 2014). Workers will undoubtedly figure out ways to "play" with the robots as well. (Sung et al., 2008).

## Effects of robotics on tourism and hospitality education

For researching what results in effective tourist and hospitality robotic skills, complementary robotic fields like information and digital technology seem to be a suitable place to start. Training research would advance the developing field of robots and its practical applications.

## Effects of robotics on tourist and hospitality facility structure

Industrial robots may have a significant impact on the creation of robot-friendly kitchens. Similar to how redesigning hotels and restaurants for efficient cleaning and customer service might be required by service robots (Vaussard et al., 2014).

## Challenges in Hospitality and Tourism

Thirty years ago, Andrew issued a challenge to academics in the hospitality industry to teach about robots in their courses. In this conceptual paper, he broadens his challenge to incorporate research in robotic design and tourism as a sixth topic. For example, the residential usage of personal service robots for tasks like serving during a cocktail party or planning diners are the subject of RoboCup@Home and RoCKIn@Home. Pedagogically, lectures should use examples of robots in readings, assignments, and debates on professional, personal, and industrial services.

## Customer Satisfaction

The expectation disconfirmation theory, sometimes known as the expectation confirmation theory, is one of the most well-known marketing theories (ECT). ECT assesses the desire to repurchase after the initial purchase. Oliver emphasises in ECT that CS is the outcome of agreement between actual performance and expected performance. Particularly, the performance of service qualities raises CS, and as a result, the improved satisfaction results in more customer loyalty and retention.

## What is food waste ai and why is it important?

Winnow Vision is the first significant entry of AI into the commercial kitchen. With an accuracy score of over 80% when recognising food that has ended up in the garbage, Winnow Vision has already outperformed humans. Data accuracy for busy kitchen teams ranges from 70 to 75 percent. For hundreds of kitchens worldwide, automation lowers entrance barriers. After Winnow Vision has been taught in your kitchen, neither data entry nor personnel training are really necessary. Winnow Vision gets smarter as more picture data is acquired. Users simply need to confirm the proposed meal when recognition capability is enabled, which results in a semi-automated condition. User time is saved and human mistake is decreased. Full automation will eventually be achieved without team input.
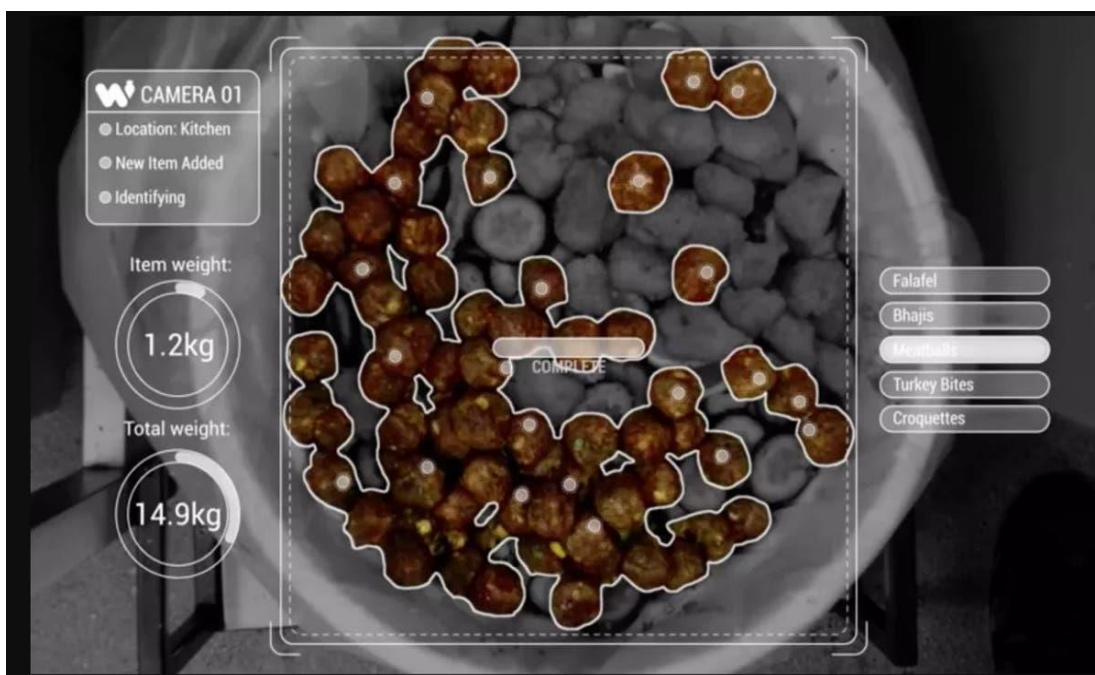


*Source:        https://www.independent.co.uk/news/business/news/ai-bin-launched-food-waste-restaurants-winnow-vision-a8835736.html*

## Final result for IKEA

Winnow and IKEA are revolutionising food waste management by creating kitchens of the future, which will benefit both their companies and future generations.

With Winnow thus far, IKEA has had excellent success:

• Food waste was reduced by 50% overall in terms of value.

• In 2018, 1.2 million meals were avoided. IKEA Bergen in Norway, for instance, recorded yearly savings of more than €125,000

The field of robotics focuses on the creation, use, and application of robots as well as the development of computer systems for their control, sensory feedback, and information processing. These technologies deal

with automated devices that can replace people in hazardous settings or production procedures or that mimic people in terms of appearance, conduct or intellect.

**Conclusion**

The purpose of this review essay was to demonstrate how robots has raised productivity in the hospitality sector. Robotics is by itself the technological trend that is dominating the market globally and is the most well-liked inside the sector. Because customers and guests are happy, motivation is higher, and revenues are boosted. There are several uses for robots in various fields, including law, entertainment, and domestic life. Robots are ushering in a new age in the hotel sector, and they are here to stay. Now is the time for all of us to embrace these improvements and make the most use of them. One consideration is how this will affect front-office services and, by extension, client preferences. The hospitality sector is moving fast and furiously toward replicating AI-enabled home and office experiences in guest rooms.The interaction between hotels and customers is gradually moving from a request-based one to a two-way dialogue, which is far more beneficial. By seamlessly integrating technology-enabled amenities, artificial intelligence (AI) greatly improves the in-room guest experience. AI automates "optimal next actions" based on guest data.

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