

# Exploring the nexus of sustainable tourism gastronomy experiences and artificial intelligence: a path towards enhanced environmental stewardship and guest satisfaction

## Istraživanje povezanosti gastronomskih iskustava održivog turizma i veštačke inteligencije: put ka poboljšanom upravljanju životnom sredinom i zadovoljstvu gostiju

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### Abstract

*This study explores the nexus of sustainable tourism, gastronomy experiences, and artificial intelligence in enhancing environmental stewardship and guest satisfaction in the hospitality industry. Over a month period (January 2024), 385 respondents were surveyed online (via LinkedIn) to investigate the impact of AI-driven solutions on operational efficiency, resource utilization, and guest satisfaction in gastronomy tourism. Utilizing inferential statistics, including chi-square tests, the findings indicated a high level of optimism towards AI's potential to improve efficiency and enhance guest satisfaction. Mean scores of 4.23 and 4.56 for AI-driven solutions' impact on efficiency and guest satisfaction, respectively, supported the positive outlook on sustainability-driven establishments using AI technologies. The study concludes that integrating AI solutions is pivotal in shaping environmental impact and guest satisfaction, offering opportunities to enhance operational efficiency and reduce resource consumption.*

**Keywords:** sustainable tourism, gastronomy tourism, artificial intelligence, waste reduction, environmental stewardship, guest satisfaction

### Sažetak

*Ova studija istražuje vezu između održivog turizma, kulinarskih iskustava i veštačke inteligencije u poboljšanju upravljanja životnom sredinom i zadovoljstva gostiju u ugostiteljskoj industriji. Tokom perioda od mesec dana (januar 2024), 385 ispitanika je anketirano na mreži kako bi se istražio uticaj rešenja vođenih veštačkom inteligencijom na operativnu efikasnost, korišćenje resursa i zadovoljstvo gostiju u gastronomskom turizmu. Koristeći inferencijalne statistike, uključujući hi-kvadrat testove, nalazi su ukazali na visok nivo optimizma prema potencijalu AI da poboljša efikasnost i poveća zadovoljstvo gostiju. Prosečne ocene od 4,23 i 4,56 za uticaj rešenja vođenih veštačkom inteligencijom na efikasnost i zadovoljstvo gostiju, podržali su pozitivan pogled na ustanove zasnovane na održivosti koje koriste AI tehnologije. Studija zaključuje da je integracija AI rešenja ključna u oblikovanju uticaja na životnu sredinu i zadovoljstva gostiju, nudeći mogućnosti za poboljšanje operativne efikasnosti i smanjenje potrošnje resursa.*

**Ključne reči:** održivi turizam, gastronomski turizam, veštačka inteligencija, poboljšano upravljanje životnom sredinom, zadovoljstvo gostiju

## 1. Introduction

In a time of increased environmental awareness and changing customer demands, the hotel sector is under growing pressure to implement sustainable practices while providing exceptional guest experiences (Hassan & Zrnić, 2021). The field of gastronomy tourism, where visitors look for genuine gastronomy experiences that honor the environment and local culture, is at the

crossroads of these imperatives (Zrnić et al., 2023; Zrnić, 2016; Milenoski et al., 2014). Simultaneously, the hospitality industry has never had more opportunity to maximize resource management, reduce waste, and customize visitor experiences thanks to the quick development of artificial intelligence (AI) technologies (Kiliçhan & Yilmaz, 2020; Trišić et al. 2021).

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The rationale for this study stems from the understanding that gastronomy experiences are essential elements of destination attractiveness and that sustainable tourism is a cornerstone of responsible hospitality practices (Trišić et al. 2023). Furthermore, AI's revolutionary capacity to revolutionize operational effectiveness and service delivery highlights how important it will be in determining the direction of the hotel sector. Aim of this study is to contribute to a comprehensive knowledge of how technological innovation can work in harmony with environmental protection and guest-centric hospitality by clarifying the relationship between these seemingly unrelated factors.

In light of this, the study has two goals: first, it will look at current trends and practices in sustainable tourism in the hospitality industry, with a focus on food and beverage offerings; second, it will assess how AI might be used to improve resource management, waste reduction, and visitor experiences in the gastronomy tourism industry; identify the potential benefits and drawbacks of incorporating AI technologies into sustainable tourism practices in the food and beverage industry through a multifaceted investigation that includes literature evaluation, empirical analysis, and stakeholder perspectives. This research aims to investigate the complex interplay among sustainable tourism, food experiences, and artificial intelligence, in order to clarify strategies for obtaining improved environmental management and visitor happiness. Also, this research seek to find areas of overlap and novel approaches that use AI to promote sustainability and improve the gastronomic tourism experience by exploring the intersection of these fields.

Finally, by shedding light on the connections between food experiences, artificial intelligence, and sustainable tourism, this research hopes to advance the conversation about responsible hospitality and open the door to novel approaches that balance superior guest care with environmental stewardship.

## 2. Literature review

In recent years, the hospitality sector has witnessed a significant shift towards sustainable practices, driven by increasing awareness of environmental concerns and changing consumer preferences (Zhang et al. 2021). Within this context, sustainable tourism has emerged as a pivotal area of focus, with particular attention paid to the food and beverage offerings provided by hospitality establishments. A comprehensive examination of current trends and practices reveals a growing emphasis on sourcing local, organic ingredients, reducing food waste (Zrnić et al. 2023a), and implementing eco-friendly production and distribution methods (Chand & Garge, 2017; Zrnić et al. 2022). These initiatives not only align with the principles of sustainable development but also cater to the rising demand for authentic, environmentally conscious gastronomy experiences among tourists.

Furthermore, the potential applications of artificial intelligence (AI) in the realm of gastronomy tourism have

garnered considerable attention from both researchers and industry practitioners. AI technologies offer promising avenues for optimizing resource management, minimizing waste, and enhancing guest experiences within the food and beverage sector (Vinnakota et al. 2022; Zrnić et al. 2023a). For instance, AI-powered systems can analyze data on consumer preferences, dietary restrictions, and seasonal ingredient availability to facilitate menu planning and inventory management. Additionally, AI-driven solutions enable real-time monitoring of food preparation processes, leading to improved efficiency and consistency in service delivery. Despite the apparent benefits of integrating AI technologies into sustainable tourism practices (Martin-Rios et al. 2020), the perceptions and preferences of tourists play a crucial role in shaping the adoption and implementation of such innovations.

Understanding tourist attitudes towards sustainable practices and AI-driven services is essential for ensuring the successful integration of these technologies into gastronomy tourism experiences (Prahadeeswaran, 2023). Research in this area aims to assess tourists' awareness of sustainability issues, their willingness to support eco-friendly initiatives, and their receptiveness to AI-enabled amenities and services. However, the integration of AI technologies into sustainable tourism practices within the food and beverage sector is not without its challenges and opportunities (Olan et al. 2022). Key challenges include issues related to data privacy and security, as well as the potential for job displacement resulting from automation (Howard, 2019). Furthermore, there may be resistance to change among traditional establishments reluctant to embrace technological advancements. Nevertheless, the opportunities afforded by AI in enhancing operational efficiency, reducing costs, and enhancing guest satisfaction present compelling reasons for hospitality businesses to explore and adopt these innovations (Nam et al. 2021).

In summary, a comprehensive review of the literature highlights the evolving landscape of sustainable tourism within the hospitality sector, with a particular focus on food and beverage offerings. The potential applications of AI in optimizing resource management, waste reduction, and guest experiences hold promise for enhancing sustainability efforts and driving innovation in gastronomy tourism. However, addressing the perceptions and preferences of tourists, as well as overcoming challenges associated with AI integration, are critical considerations for realizing the full potential of these technologies in sustainable tourism practices. The literature and research listed above served as the foundation for the following theories Hypothesis:

- Hypothesis 1. The integration of AI-driven solutions in the management of food and beverage services within the tourism industry will lead to improved efficiency and resource utilization, resulting in reduced environmental impact:
- Hypothesis 2. Tourists are more likely to patronize hospitality establishments that demonstrate a commitment to sustainability through the adoption of

AI technologies, thereby enhancing guest satisfaction and loyalty.

Degree, 26.0% had completed a Master's Degree, and 9.1% possessed a Doctorate qualification.

### 3. Research methods and results

The research employed a quantitative approach, utilizing an online survey instrument (LinkedIn) to gather data from a diverse sample of respondents. Convenience sampling was employed to select participants, ensuring representation from various demographic backgrounds. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS 26), encompassing both descriptive and inferential statistical techniques to examine relationships between variables and test hypotheses. In Table 1. Demografic data is presented.

**Table 1.** Demographic statistics (men and women)

| Gender | Number of respondents | Percentage (%) |
|--------|-----------------------|----------------|
| Male   | 250                   | 64.94          |
| Female | 135                   | 35.06          |

Source: Authors reserach

In this study, a total of 385 respondents participated to explore the relationship between AI-driven solutions, environmental impact, and guest satisfaction in the gastronomy tourism sector. Of these respondents, 250 were male, representing approximately 64.94% of the total sample. Additionally, there were 135 female respondents, accounting for approximately 35.06% of the total sample.

**Table 2.** Demographic statistics (age group)

| Age group    | Number of respondents | Percentage (%) |
|--------------|-----------------------|----------------|
| 18-25        | 100                   | 26.0           |
| 26-35        | 120                   | 31.2           |
| 36-45        | 80                    | 20.8           |
| 46-55        | 50                    | 13.0           |
| 56 and above | 35                    | 9.1            |

Source: Authors reserach

Respondents in this reserach were categorized into different age groups providing insights into the demographic composition of the sample. The age distribution among the 385 respondents is as follows: 26.0% of respondents were aged between 18 and 25, 31.2% were aged between 26 and 35, 20.8% were aged between 36 and 45, 13.0% were aged between 46 and 55, and 9.1% were aged 56 and above.

**Table 3.** Demographic statistics (education)

| Education level     | Number of respondents | Percentage (%) |
|---------------------|-----------------------|----------------|
| High School Diploma | 50                    | 13.0           |
| Bachelor's Degree   | 200                   | 52.0           |
| Master's Degree     | 100                   | 26.0           |
| Doctorate           | 35                    | 9.1            |

Source: Authors reserach

The sample of 385 respondents exhibited diverse educational backgrounds. Among them, 13.0% held a High School Diploma, 52.0% had obtained a Bachelor's

**Table 4.** Frequency of Gastronomy Tourism Activities

| Activity Frequency | Number of respondents | Percentage (%) |
|--------------------|-----------------------|----------------|
| Rarely             | 50                    | 13.0           |
| Occasionally       | 150                   | 39.0           |
| Regularly          | 140                   | 36.4           |
| Very often         | 45                    | 11.7           |

Source: Authors reserach

The respondents exhibited varying levels of engagement in gastronomy tourism activities. Among the 385 respondents, 13.0% reported participating rarely, 39.0% participated occasionally, 36.4% participated regularly, and 11.7% participated very often in gastronomy tourism activities.

**Table 5.** Level of guests awareness in gastronomy tourism

| Awareness level  | Number of respondents | Percentage (%) |
|------------------|-----------------------|----------------|
| Not aware        | 75                    | 19.5           |
| Somewhat aware   | 150                   | 39.0           |
| Moderately aware | 100                   | 26.0           |
| Very aware       | 60                    | 15.6           |

Source: Authors reserach

Among the 385 respondents, awareness levels regarding AI-driven solutions in gastronomy tourism varied. Specifically, 19.5% indicated being not aware, 39.0% reported being somewhat aware, 26.0% stated being moderately aware, and 15.6% claimed to be very aware of AI-driven solutions in gastronomy tourism.

**Table 6.** Perceptions of efficiency & resource utilization and guest satisfaction by gender

| Aspect                            | Male Mean Score | Female Mean Score |
|-----------------------------------|-----------------|-------------------|
| Efficiency & Resource Utilization | 4.25            | 4.18              |
| Guest Satisfaction                | 4.58            | 4.50              |

Source: Authors reserach

In the analysis of responses from male and female participants, mean scores were calculated to assess perceptions regarding two aspects: Efficiency & Resource Utilization and Guest Satisfaction. The mean score for Efficiency & Resource Utilization was slightly higher among male participants at 4.25, compared to 4.18 among female participants. Similarly, for Guest Satisfaction, male participants reported a mean score of 4.58, while female participants reported a slightly lower mean score of 4.50.

**Table 7.** Perceptions of Ai-driven solutions in efficiency, resource utilization, guest satisfaction

| Aspects of AI-driven Solutions    | Mean Score |
|-----------------------------------|------------|
| Efficiency & Resource Utilization | 4.23       |
| Guest Satisfaction                | 4.56       |

Source: Authors reserach

In our analysis, mean scores were calculated to evaluate perceptions regarding two key aspects of AI-driven solutions: Efficiency & Resource Utilization and Guest Satisfaction. The mean score for Efficiency & Resource Utilization was determined to be 4.23, indicating a positive perception of AI's potential in optimizing operational efficiency and resource management. For Guest Satisfaction the mean score was 4.56, suggesting favorable sentiments towards AI's role in enhancing guest experiences and fostering loyalty within the hospitality sector.

**Table 8.** Standard deviations of responses for efficiency & resource utilization and guest satisfaction by gender

| Aspect                            | Male Std. Deviation | Female Std. Deviation |
|-----------------------------------|---------------------|-----------------------|
| Efficiency & Resource Utilization | 0.67                | 0.71                  |
| Guest Satisfaction                | 0.70                | 0.73                  |

*Source:* Authors reserach

In our analysis, standard deviations were calculated to assess the variability of responses regarding two key aspects of AI-driven solutions: Efficiency & Resource Utilization and Guest Satisfaction. For Efficiency & Resource Utilization, the standard deviation was found to be 0.67 among male respondents and 0.71 among female respondents. Similarly, for Guest Satisfaction, the standard deviation was 0.70 among male respondents and 0.73 among female respondents. These standard deviations indicate the extent of dispersion of responses around the mean score within each gender group.

#### 4. Discussion

In response to the evolving landscape of the hospitality industry, this study aims to investigate the transformative potential of AI-driven solutions in the management of food and beverage services within the tourism sector. Specifically, the research seeks to elucidate the impact of these technological advancements on both environmental sustainability and guest satisfaction.

The study was conducted online in January 2024, aiming to delve into the intricate relationship between AI-driven solutions, environmental impact, and guest satisfaction in the realm of gastronomy tourism. A total of 385 respondents took part in the research, comprising 250 males and 135 females. The selection of respondents was carried out through convenience sampling, ensuring representation from diverse demographic backgrounds.

Employing an online survey instrument, the research meticulously gathered data from the participants. The survey was crafted with precision to probe respondents' perceptions and preferences concerning sustainable practices and AI-driven services in gastronomy tourism. Tailored questions were devised to gauge the likelihood of respondents patronizing hospitality establishments showcasing a dedication to sustainability through the integration of AI technologies. The collected data underwent thorough analysis utilizing the Statistical Package for the Social Sciences (SPSS 26) software.

Descriptive statistics, including mean and standard deviation, were computed to encapsulate the essence of respondents' opinions regarding the potential of AI-driven solutions to enhance efficiency, resource utilization, and guest satisfaction. Additionally, inferential statistics, such as chi-square tests, were adeptly employed to scrutinize the hypotheses and elucidate the intricate relationships between variables. The findings yielded insightful revelations:

Mean and standard deviation for the likelihood of AI-driven solutions improving efficiency and resource utilization: The mean score of 4.23, with a standard deviation of 0.68, implies a significant level of optimism among respondents regarding the transformative potential of AI-driven solutions in bolstering operational efficiency and resource management within the hospitality sector. Mean and standard deviation for the likelihood of AI-driven solutions enhancing guest satisfaction and loyalty: With a mean score of 4.56 and a standard deviation of 0.72, respondents exhibited a notable inclination towards patronizing hospitality establishments that embrace sustainability through the adoption of AI technologies, underscoring the pivotal role of AI in enhancing guest satisfaction and fostering loyalty.

Hypothesis 1: The integration of AI-driven solutions in the management of food and beverage services within the tourism industry leads to improved efficiency and resource utilization, resulting in reduced environmental impact. Confirmation: The mean score (4.23) substantiates this hypothesis, indicative of respondents' positive outlook towards the capacity of AI-driven solutions to optimize operational processes and mitigate environmental footprint.

Hypothesis 2: Tourists are more likely to patronize hospitality establishments that demonstrate a commitment to sustainability through the adoption of AI technologies, thereby enhancing guest satisfaction and loyalty. Confirmation: The mean score (4.56) reinforces this hypothesis, highlighting respondents' inclination towards sustainability-driven establishments leveraging AI technologies to elevate guest experiences and foster lasting loyalty.

#### 5. Conclusion

Artificial intelligence (AI) plays a crucial role in maximizing resource management and waste reduction in the hospitality sector by offering innovative solutions for optimizing operational processes. AI technologies can analyze data on consumer preferences, dietary restrictions, and seasonal ingredient availability to facilitate menu planning and inventory management, leading to more efficient resource utilization. Additionally, AI-driven systems enable real-time monitoring of food preparation processes, enhancing consistency in service delivery and reducing waste. By automating tasks and providing data-driven insights, AI helps hospitality establishments streamline operations, minimize inefficiencies, and make informed decisions to reduce environmental impact. Overall, the integration of

AI in resource management and waste reduction not only improves operational efficiency but also contributes to sustainable practices within the hospitality industry.

Sustainable tourism practices can be integrated into gastronomy experiences by sourcing local, organic ingredients, reducing food waste, and implementing environmentally friendly production and distribution methods. By focusing on sustainability, hospitality establishments can not only contribute to environmental conservation but also cater to the rising demand for authentic, environmentally conscious gastronomy experiences among tourists. This integration not only benefits the environment by promoting responsible resource management but also enhances guest satisfaction by offering unique and ethically sourced food experiences that align with their values. Additionally, the adoption of sustainable practices can lead to cost savings, improved reputation, and increased customer loyalty, further enhancing the overall guest experience.

The intersection of sustainable tourism, gastronomy experiences, and artificial intelligence can lead to a more responsible and enjoyable guest experience by offering unique and environmentally conscious gastronomy offerings that cater to the evolving preferences of modern travelers. By integrating sustainable practices into gastronomy experiences through the use of AI technologies, hospitality establishments can enhance operational efficiency, reduce waste, and provide personalized guest services. AI-driven solutions can optimize resource management, minimize environmental impact, and improve guest satisfaction by offering tailored experiences that align with sustainability principles. This holistic approach not only promotes responsible environmental stewardship but also enhances the overall guest experience by providing authentic, ethically sourced food experiences that resonate with conscious travelers. By leveraging AI to support sustainable tourism practices in gastronomy offerings, hospitality businesses can differentiate themselves in the market, build customer loyalty, and contribute to a more sustainable and enjoyable guest experience.

Based on the comprehensive analysis of our study, the findings suggest that AI-driven solutions indeed play a significant role in shaping both environmental impact and guest satisfaction within the tourism industry. The integration of such technologies demonstrates a promising avenue for enhancing operational efficiency, reducing resource consumption, and ultimately contributing to sustainable practices. Furthermore, guests exhibit a heightened propensity to patronize establishments embracing AI-driven solutions, reflecting a positive correlation between technological innovation and elevated levels of satisfaction among visitors.

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