AI in Tourism: Unveiling the Potential and Benefits for SMEs in the Hotel Sector (SHORT VERSION)

Results of an online survey among hotels in Austria, France, Germany, Greece and Switzerland

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> Executive Summary

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Executive Summary (I)

- An **online survey** was designed to assess the adoption, benefits and challenges of **Artificial Intelligence (AI) technologies** among SMEs in the European hospitality industry. The questionnaire was disseminated through hotel associations spanning **five countries: Austria, Germany, Greece, France, and Switzerland**. Garnering **feedback from 1,115 hotels**, the sample encapsulates a broad spectrum of the hotel industry, reflecting variations in establishment size, classification, and geographical setting. Given that Greece heavily dominates the sample (50% of hotels in sample), and its results differ considerably from other regions, we have conducted specific analyses focusing on the DACH region, encompassing Germany (D), Austria (A), and Switzerland (CH).
- The rapid evolution of Artificial Intelligence (AI) presents a transformative opportunity for the hospitality sector. As this study reveals, the **potential benefits of AI are vast, ranging from operational efficiency to enhanced customer experiences**. However, the journey to successful AI adoption is multifaceted and requires a **comprehensive strategy that addresses both technological and human elements**.

Executive Summary (II)

Key Findings:

- **Current State of AI Adoption**: The study shows that the level of AI adoption varies across the hospitality industry. While chain hotels and higher-star or larger properties show a higher propensity to integrate AI technologies, smaller properties and those in certain regions lag behind. This disparity highlights the need for a more consistent approach to AI integration across the industry.
- **Holistic Approach to AI Adoption**: The integration of AI in the hospitality sector is not merely about implementing advanced tools. It demands a focus on education, ensuring hoteliers, especially from older generations, understand the tangible benefits and associated costs of AI. This foundational knowledge is crucial for informed decision-making and effective AI integration.

Executive Summary (III)

- **Personalized Customer Experiences**: AI's potential in personalizing guest experiences is evident. Technologies like facial recognition for swift check-ins, passport validation for enhanced security, and chatbots for real-time guest communication are just the tip of the iceberg. However, the industry's reception to these innovations is varied. While some technologies, such as real-time revenue management and SEO enhancement, are hailed as revolutionary, others, like virtual assistants, received a lukewarm response.
- **Operational Efficiency**: AI's impact isn't limited to guest experiences. The survey highlighted its pivotal role in fraud protection, streamlining employee training, and ensuring consistent occupancy rates, underscoring AI's potential to revolutionize the back-end operations of hotels.

Executive Summary (IV)

- **Collaboration is Key**: A significant takeaway from the study is the need for a symbiotic relationship between hoteliers and technology providers. Recognizing that technology providers often drive innovation, it's essential for hoteliers to collaborate closely with them, ensuring solutions are tailored to specific needs and challenges.
- **Addressing Resistance**: Change management emerged as a crucial aspect of AI adoption. Resistance, especially from the older generation of hoteliers, can be a significant barrier. Addressing this requires strategies that encompass training, support, and a focus on showcasing tangible benefits.

➢ In summary, the hospitality industry is on the cusp of a technological revolution with AI at the forefront. While the **benefits are clear, the path to successful adoption is fraught with challenges**. By focusing on **education, fostering collaboration and understanding the nuanced needs of the sector, the industry can fully harness the transformative power of AI** and ensure a future that's efficient, guest-centric and ahead of the curve.

> AI in the hotel sector

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Potential of AI in the hotel sector (I)

Forecasts

Discovery

Planning

Generation

AI is a revolution in digital transformation

Facial recognition

Natural language processing

Robotics

Control

Potential of AI in the hotel sector (II)

Artificial intelligence (**AI**) offers a transformative potential for the hotel sector, from enhancing guest experiences to streamlining operations and driving revenue growth. As the technology continues to evolve, its adoption will likely become a key differentiator in the competitive hospitality landscape.

- **1. Enhanced Customer Experience**: Artificial Intelligence (AI) in the hotel sector offers the potential to significantly enhance the guest experience. AI-driven systems can provide **personalized messages and recommendations** to guests before their stay, enhancing their anticipation and planning. During their stay, **facial recognition systems** can streamline check-in processes, while **virtual assistants and chatbots** can respond to guest queries, manage in-room technologies, and even handle reservations. AI also makes it possible to collect information about customer preferences by adding them to customer profiles. Post-stay, AI can **automate feedback responses** and offer personalized promotions to encourage return visits.
- **2. Operational Efficiency**: AI technologies can **automate or enhance various tasks** in hotels. For instance, **real-time revenue management** can adjust room rates based on current market conditions and other factors like weather. **Predictive analytics, using AI algorithms**, can analyze vast amounts of historical and current data to **forecast** likely future outcomes, aiding in operational planning. Furthermore, AI can assist in creating effective job advertisements and interview questions, considering the job role and company policy.

Potential of AI in the hotel sector (III)

- **3. Personalized Marketing and Service Offerings**: AI allows hotels to better **understand guest preferences**, using available data to offer more tailored experiences. This **personalization** extends to marketing, with AI-driven systems suggesting optimal images, titles, and texts for marketing campaigns. Such **targeted marketing** can lead to higher conversion rates, directly impacting revenue.
- **4. Competitive Advantage and Customer Loyalty**: In the luxury hotel sector, where many establishments offer high-end amenities like premium restaurants and spas, differentiation comes from understanding and catering to guest needs. AI-driven insights provide this edge, leading to improved guest satisfaction. A better guest experience not only increases the likelihood of return visits but also boosts referrals and the potential for guests to spend more during subsequent stays.
- **5. Back-end Operations and Predictive Maintenance**: AI can play a pivotal role in the back-end operations of hotels. **Predictive maintenance**, for instance, uses AI systems to monitor technological systems in the hotel, identifying potential issues before they lead to breakdowns. This proactive approach can lead to significant cost savings and prevent disruptions that could negatively impact the guest experience. The use of AI can also optimise energy and water consumption, as well as food waste.

AI use cases in the hotel sector (I)

Interaction type	Domain	AI technology	Description
Direct interaction with customers	Service (Reception)	ChatBot	Instant messaging applications that can simulate and process a written human conversation by generating automated responses based on user requests (Oracle, n.d.). Often available on websites, social networks and messaging systems.
	Service	**Virtual assistants or voice assistants**	**They are software agents that can be voice-activated to perform specific tasks by processing human voice input and generating consistent and tailored responses (e.g., Apple's Siri, Amazon's Alexa, etc.) (Buhalis & Moldavska, 2022). They can be used to allow guests to manage different technologies in their room using voice commands (Kılıçhan & Yılmaz, 2020).**
	Service (Reception)	Passport validation	Automated entry and validation of passport information at customer check-in, including automated translation capabilities (Nam et al., 2021; Mallys, 2019).
	Service (Reception)	**Facial recognition systems**	**Identifying or verifying an individual's identity based on their face at customer check-in (e.g. using kiosks/automated check-in kiosks or applications) (Nam et al., 2021; Revfine, n.d.; Mallys, 2019).**
	Service	Robotic technologies	A robot is an autonomous physical object equipped with AI and sensors that enable it to perceive its environment, make decisions and perform actions accordingly (Bulchand-Gidumal, 2020). There are many robots: room service robots (Kılıçhan & Yılmaz, 2020; Nam et al., 2021), concierge robots (Kılıçhan & Yılmaz, 2020), receptionist robots (Kılıçhan & Yılmaz, 2020), chef robots (Kılıçhan & Yılmaz, 2020), etc.

AI use cases in the hotel sector (II)

Background operations	Marketing	Customer profiling	Customer profiling is based on the analysis of interactions between a large number of data points (restaurants, spas, etc.) (Nam et al., 2021; Bulchand-Gidumal, 2020).
	Marketing	Personalised service for customers	Personalisation techniques aim to provide users with information personalised to their preferences and limitations (including the method of associating recommendations) (Nam et al., 2021; Bulchand-Gidumal, 2020; Bhattacharjee, Seeley & Seitzman, 2017). For example: personalised emails, recommendations, information provided via a guest app.
	Marketing	Analysis of customer appreciation and loyalty	Sentiment analysis is an AI task that analyses text and assesses whether it is 'negative', 'positive' or 'neutral', as well as more specific emotions such as 'very happy', 'happy', 'sad', 'angry', etc. (Sarker, 2021).
	Marketing	Automated responses to customer	The system automatically generates personalised suggestions in response to a customer review using sentiment and topic analysis (FHT, n.d.).
	F&B	Automatic menu creation and validation	Automating the costing of menu changes and streamlining the routine validation process (Nam et al., 2021).
	F&B	Table management	Using AI algorithms to optimise and automate restaurant placement (DigitalFoodLab, n.d.).
	F&B	Solution for measuring and monitoring food waste	Using a technology called computer vision to measure and monitor food waste by automatically capturing food waste with smart cameras placed above waste bins (Kitro, n.d.; Hotel Business, 2019).

AI use cases in the hotel sector (III)

Background operations	Finance	Real-time revenue management	Room rates are updated in real time to reflect current market conditions (Hollander, 2023).
	Administration / Finance/ HR	Predictive analysis	Use of algorithms and AI techniques to analyse large amounts of historical and current data to predict the most likely future outcomes and improve operational planning (Nam et al, 2021; Bulchand-Gidumal, 2020; Doborjeh, Hemmington, Doborjeh & Kasabov, 2022; Bhattacharjee, Seeley & Seitzman, 2017). For example: occupancy, hotel profitability, human resource allocation, feedback and hotel responses.
	Administration	Room allocation	Room allocation is optimised using AI to maximise room utilisation and profits (Nam et al., 2021).
	HR	Workforce planning	Automated personnel planning using AI algorithm: especially rule based engine (Lineup.ai, n.d.; Celayix, n.d.; Rose, 2022).
	Property	Predictive maintenance	Monitoring of machines during normal operation to detect and predict possible malfunctions (AltexSoft, 2018).
	Property	Optimisation of energy and water consumption	- Use of wireless IoT technology and real-time AI-driven automation (Nam et al., 2021; Pagel, 2022; Shukla, 2023). - Use of an AI-based power backup system that manages power charging and distribution by adjusting these parameters based on usage levels and needs (Nam et al., 2021).
	Property	Orchestration services	Automated management of various processes between applications and IT systems (Nam et al., 2021; Databricks, n.d.).
	Property	Motion detection	The room automatically adjusts its temperature according to the presence of the guest, detected by a sensor (Nam et al., 2021).

Generative AI in the Hotel Industry (I)

- Generative AI has made rapid progress in recent years, with the development of models such as GPT, Bard, PaLM, Stable Diffusion, Make-A-Video and DALL-E 2. These models have been trained on large datasets and are constantly updated.
- Their capabilities range from **high-quality text recognition to the generation of text, images, video and audio**. However, they are prone to biases and inaccuracies, such as generating false information or having limited access to knowledge (Maslej et al., 2023, p.12).
- Despite these challenges, tools such as ChatGPT have been shown to **improve the quality of work and increase productivity**, particularly for tasks such as generating employee references, responding to customer service requests, brainstorming, search engine queries and drafting emails (Noy & Zhang, 2023).

Generative AI in the Hotel Industry (II)

- Models such as DALL-E 2 can create stunningly **realistic images and art**, model fashion and interior design, or edit photos using natural language descriptions. There are also services that can generate font combinations for brochures or automatically create names and logos (Lin, 2022).
- Gartner predicts that by 2025, 30% of large companies' **marketing messages will be automated**, up from less than 2% in 2022. By 2030, a film created 90% by AI is expected to be a major success (Wiles, 2023).
- Generative AI offers SMEs in the hospitality and tourism sector **more control over their creative projects in the social media age**, allowing them to manage these projects in-house (Tuomi, 2023). However, these technologies must be user-friendly and beneficial for businesses to adopt them.
- Personalising the customer experience is becoming increasingly important in the hospitality industry. AI technologies can **create highly personalised experiences**, **understand customers** and deliver exceptional stays. Generative AI plays a crucial role in this trend, enabling the recommendation of personalised options and creating unique experiences.

Potential scenarios for the use of generative AI (I)

Case studies	Description
Text generation and summarisation, information extraction and translation	Text generation for emails Summarise emails, meeting notes and minutes to make them useful in any business process Select keywords, categorise elements (e.g. contacts in emails, social network profiles of customers, suppliers, etc.) Improve the composition of correspondence by adjusting grammar, word choice, tone and formality. Translating
Integration with chatbots and other systems (e.g. PMS, CRM)	Providing information, taking orders, assisting with and confirming bookings, dealing with customer enquiries and complaints Preparing sales presentations and other documents such as company policies, privacy policies, etc.
Human resources	Creation of attractive and effective advertisements, interview questions taking into account employment and company policies Provision of information on conditions, regulations, laws etc. Learning process (generation of quizzes or tutorials etc.)
Marketing	Analyse customer comments (identify themes, emotions and trends or patterns) Break down comments by category (e.g. quality of service or food) Personalise responses to online customer reviews Generate synthetic data to improve the performance of AA models (e.g. customer comment analysis) Text generation and copywriting (e.g. posting to blogs, social networks, email campaigns and other texts) Text title optimisation and text optimisation for Search engines Keyword suggestions Personalisation of information and recommendations according to customer preferences Create images of rooms and facilities without the need for expensive professional photography

(Cookorico, 2023 ; Carvalho & Ivanov, 2023 ; Wiles, 2023 ; Gonzalo, 2023 ; Simseo, 2023 ; Hotelchamp, 2023 ; Morand & Benassi-Faltys, 2023)

Potential scenarios for the use of generative AI (II)

New products and services	**Generating new ideas** **Identifying new opportunities**
Restaurant	Create personalised menus based on customer tastes and dietary restrictions Customise restaurant menus based on customer data and dietary trends
Design	**Creation of 3D models of rooms (with furniture and decoration)**
Customer experience	Personalisation based on customer habits (creation of a personalised room, room customisation) Personalised responses (e.g. chatbot communication) Voice interaction
Decision support	**Suggestions for possible decisions**

(Cookorico, 2023 ; Carvalho & Ivanov, 2023 ; Wiles, 2023 ; Gonzalo, 2023 ; Simseo, 2023 ; Hotelchamp, 2023 ; Morand & Benassi-Faltys, 2023)

> The Survey

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The questionnaire

- The questionnaire, comprising 21 questions, was crafted drawing insights from a literature review, which included the TOE framework, semi-structured interviews, feedback from hotels, and expertise from hotel associations such as HotellerieSuisse in Switzerland, IHA in Germany, and ÖHV in Austria.
- The questionnaire is divided into several sections:
  - **General information** about the hotel: This section collects demographic and operational data, allowing the analysis of the specific features of hotels according to their characteristics and location.
  - **Organisation (data/IT):** This looks at the internal management of information systems and data storage.
  - **TOE framework**: This section examines the factors that influence the adoption of AI, based on the vision of the establishments, their digitalisation policy and external factors.
  - **AI technologies in practice**: This assesses the current use of AI and the perceived benefits, leaving room for any unmentioned technologies.
  - **Challenges or barriers**: This section aims to identify the challenges faced in integrating AI.
  - **Opinions on benefits**: This gathers opinions on the most relevant areas for the application of AI in tourism by SMEs.

The survey administration

- The questionnaire was translated in 4 languages : French, German, English and Greek.
- The survey was addressed **between May to July 2023** to the member hotels of the different hotel associations:
  - ÖHV in Austria
  - IHA in Germany
  - GNI/GHR in France
  - Research Institute for Tourism (RIT) for the Hellenic Chamber of Hotels in Greece
  - HotellerieSuisse in Switzerland
- The different hotel associations contacted their members either by email (A, CH, D, GR) or through newsletters (F).
- As not all hotels replied to all questions, the number of responses can vary from one to another question.

> The Sample

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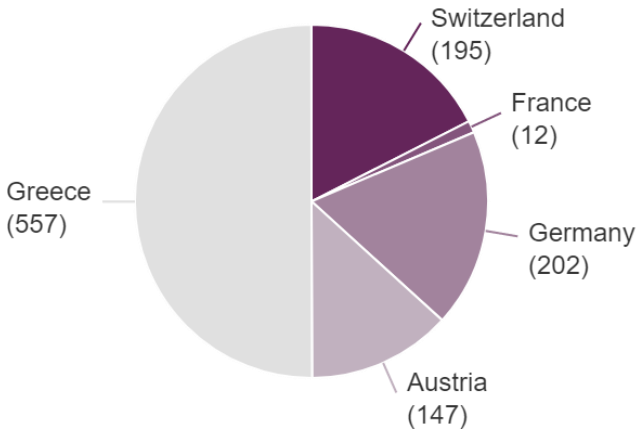
Methodological remarks: sampling

In total, we received **1,115 individual responses** from hotels through the online survey. However, there were significant variations in response rates by country. Given that Greece heavily dominates the sample and its results differ considerably from other regions, we have conducted **specific analyses focusing on the DACH region, encompassing Germany (D), Austria (A), and Switzerland (CH).**

In which country is your hotel located?

Effective responses: 1,113 *Response rate: 100%*



- Greek hotels with more than 550 responses provide around 50% of all the responses in the sample, whereas France with 12 responses provides 1% of the overall sample
- German hotels: around 18% of the overall sample
- Swiss hotels: around 17% of the overall sample
- Austrian hotels: around 13% of the overall sample

Summary of further overall sample characteristics

A breakdown of the responses reveals:

- **Hotel Location**: Most hotels were located in coastal areas (23%), rural villages (22%) and large cities (22.8%). Smaller towns accounted for 16% and mountain villages/stations for 15%.
- **Hotel Type**: A majority were independent hotels (82%), with 12% belonging to hotel chains and 6% being part of a hotel cooperation.
- **Guest Profile**: 76% catered mainly to vacationers or leisure travelers, while 19% primarily served business travelers.
- **Hotel Classification**: In the sample, 90% of the hotels were classified. The majority were 3-star hotels (35%), followed by 4-star hotels (34%). 5-star hotels accounted for 10% and 2-star hotels for 17%.
- **Hotel Size** : The sample comprises hotels representing a diverse range in terms of room numbers. The median values for room numbers in these hotels are as follows: Austria stands at 50 rooms, Germany at 44 rooms, Greece at 35 rooms, and Switzerland leads with 54 rooms.

Country-specific insights highlighted variations in hotel locations, types, and classifications across countries. For instance, vacation/leisure hotels were predominant in Austria, Greece and Switzerland, while business hotels were more common in Germany.

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> The Survey Results: Information System and Data Management

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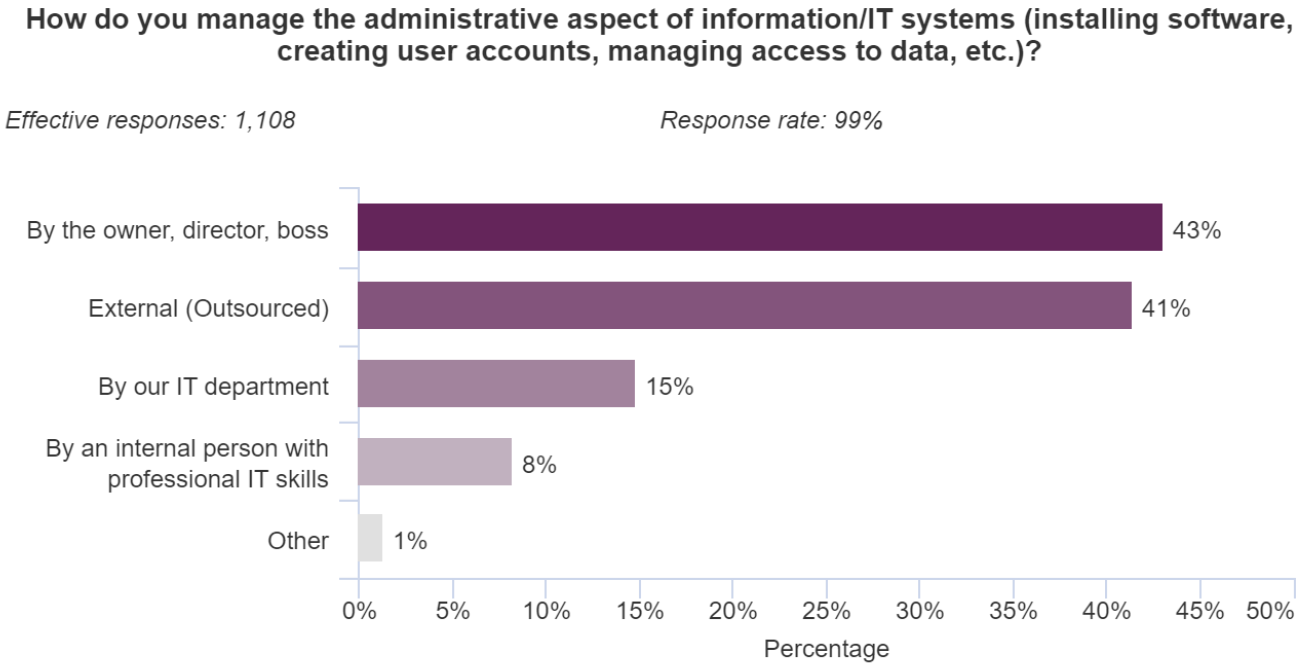
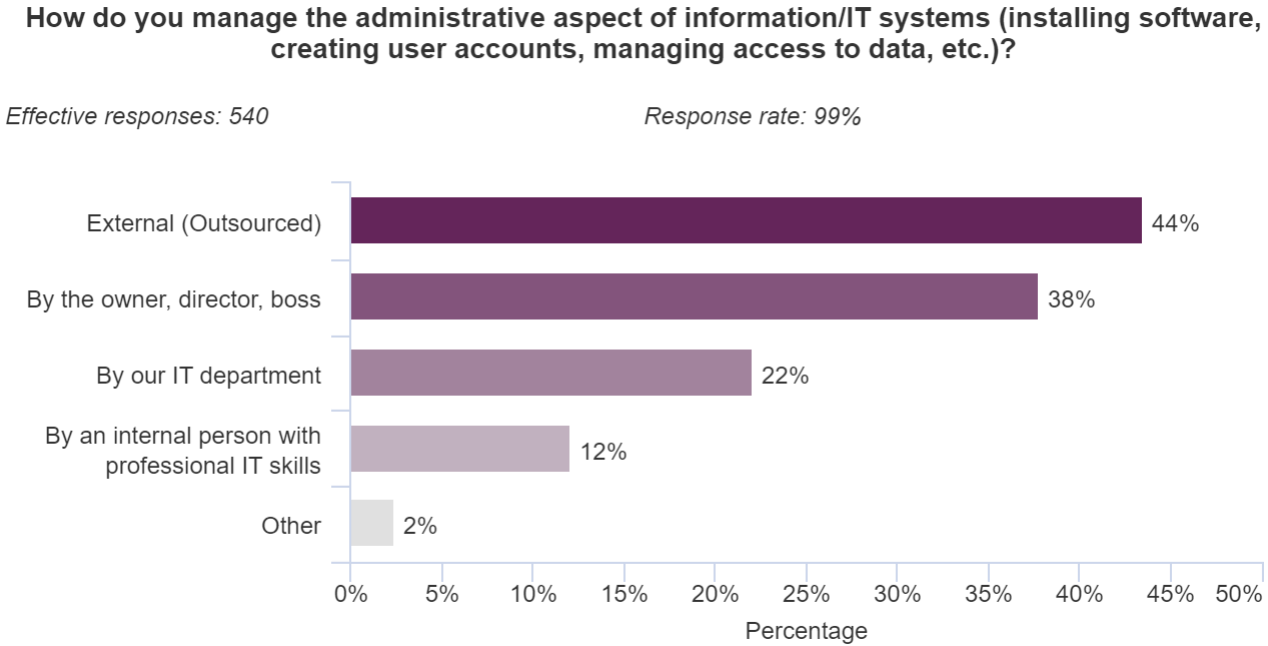
Management of administrative aspects of information/IT systems (overall sample)



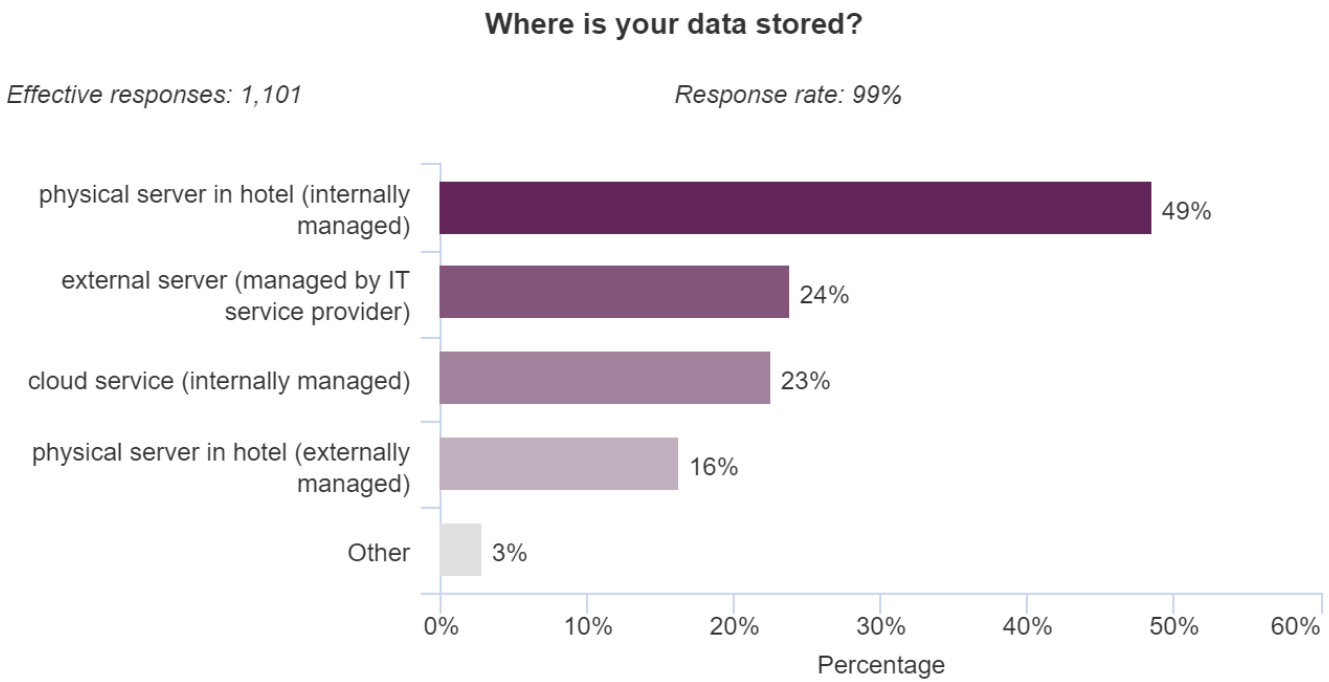
In most hotels, information technology is directly managed in-house, with 43% overseen by the owner or director. However, 41% of hotels choose to either fully or partially outsource this responsibility

Management of administrative aspects of information/IT systems (only hotels of DACH region)



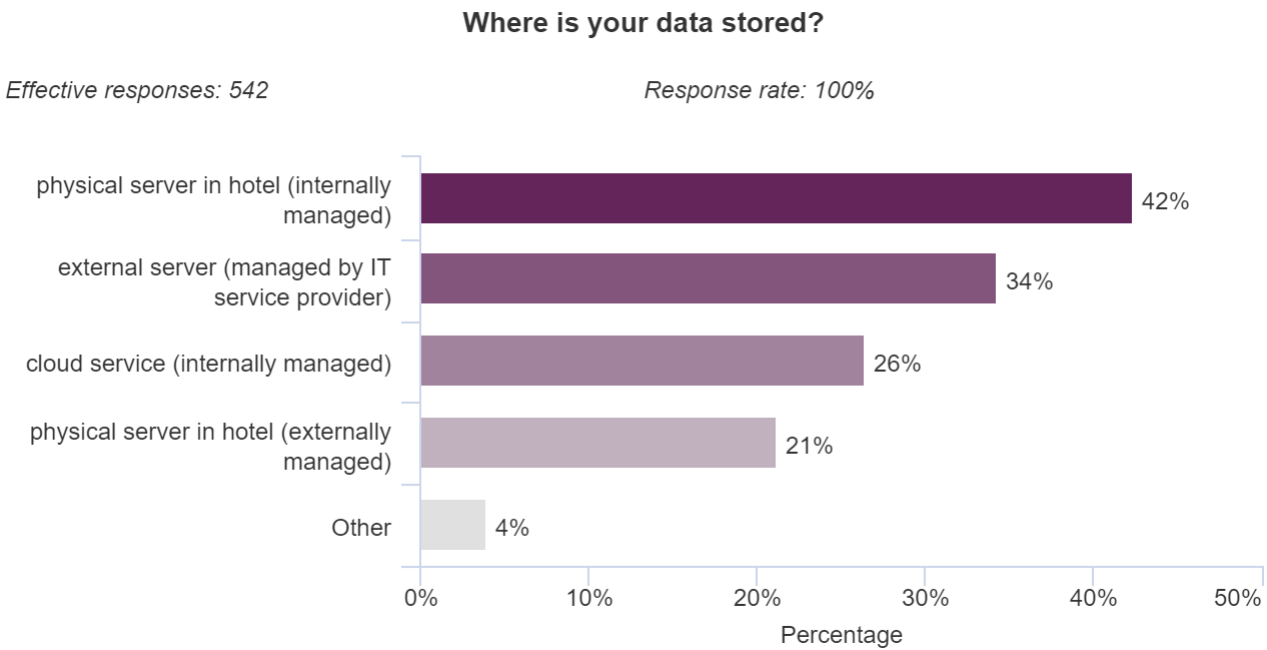
In the DACH region's hotels, almost half (44%) outsource the administrative aspects of information/IT, while 38% manage their information technology in-house.

Data storage (overall sample)



The majority of hotels primarily store their data on on-site physical servers. However, cloud services are gaining traction, with one in every four hotels now utilizing them for data storage

Data storage (only hotels of DACH region)



In 42% of hotels, data is primarily stored on on-site physical servers. Yet, in the DACH region, external servers are preferred by 34% of hotels, a notable increase compared to the overall sample at 24%.

> The Survey Results: AI Technology Adoption

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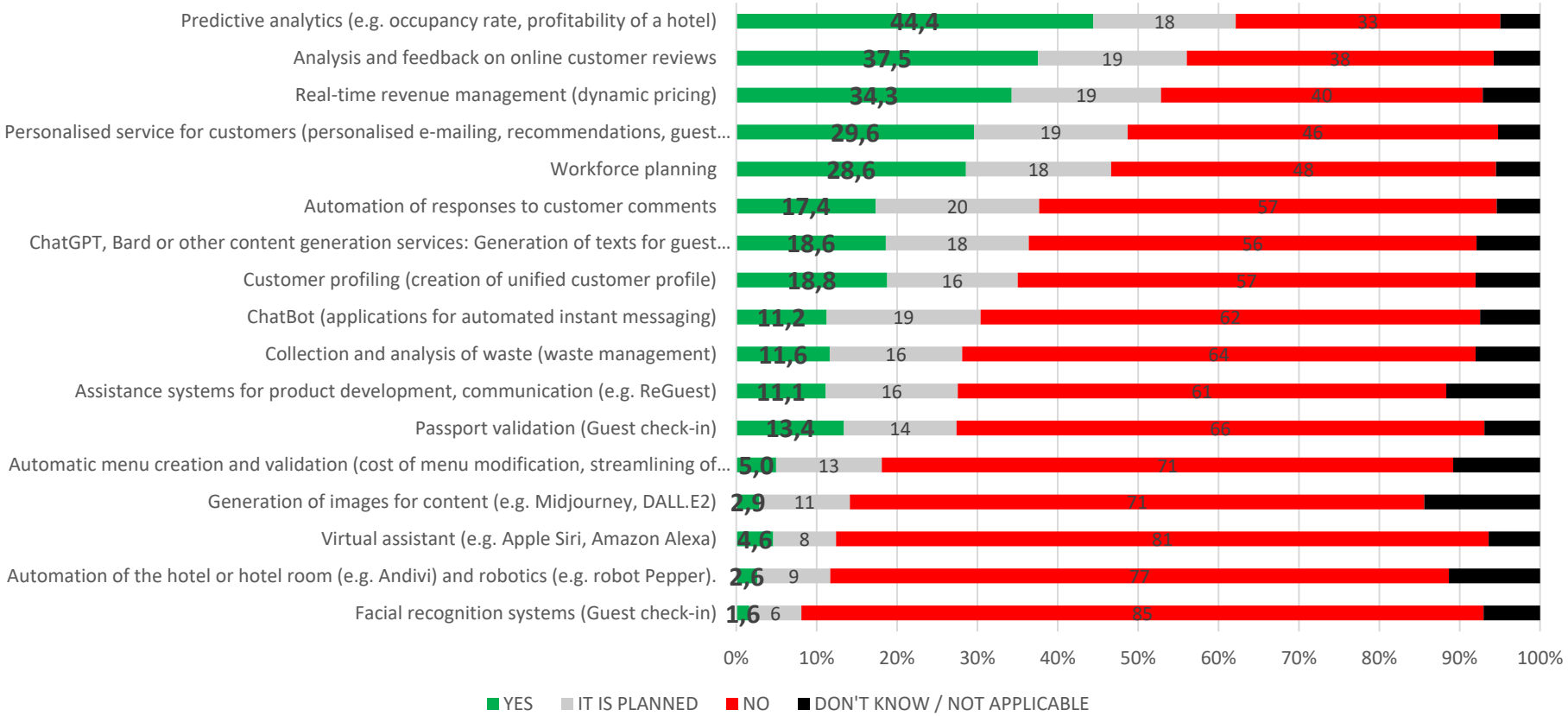
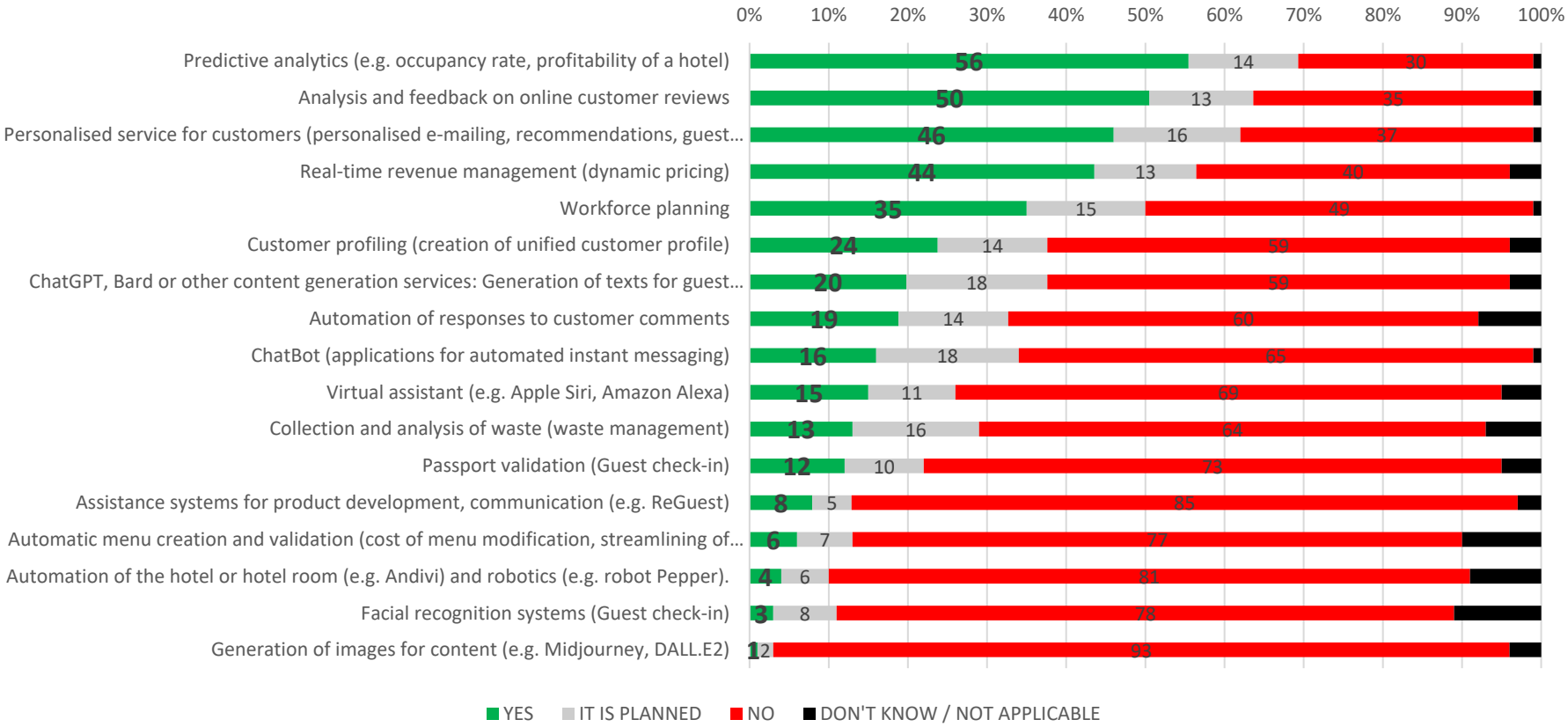
Adoption of AI technologies (overall sample)

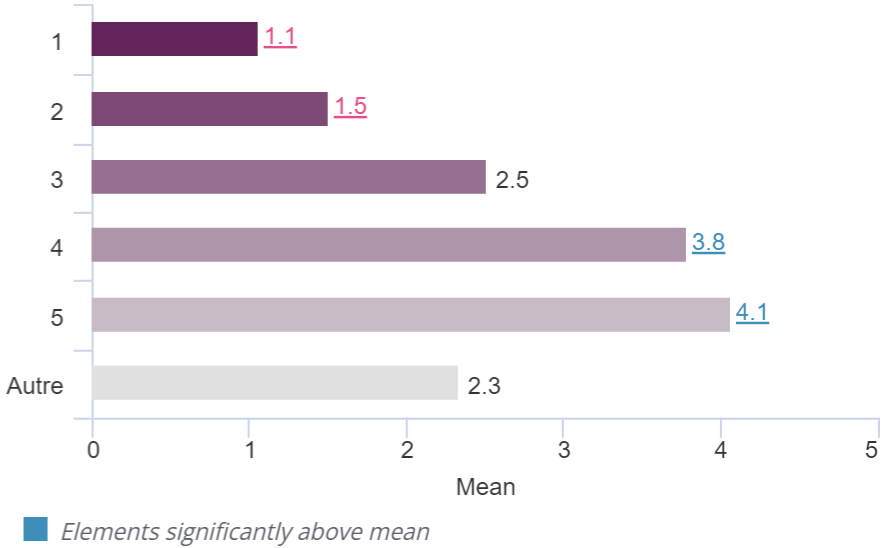


Adoption of AI technologies (only hotels from DACH region)



Total number of AI technologies adopted by hotel category

	TOTAL NUMBER OF AI TECHNOLOGIES ADOPTED
1	1.1
2	1.5
3	2.5
4	3.8
5	4.1
Autre	2.3
TOTAL	**2.9**



The relationship is very significant. p-value= < 0,01 ; Fisher= 21.6.
Inter variance= 172.7. Intra variance= 8.0.

Out of 17 AI-based services evaluated, the hotels in the study adopted an average of 2.9 services (17%). The graphic illustrates that the number of adopted AI technologies increases with the hotel's star rating.

> The Survey Results: AI Technology Perception

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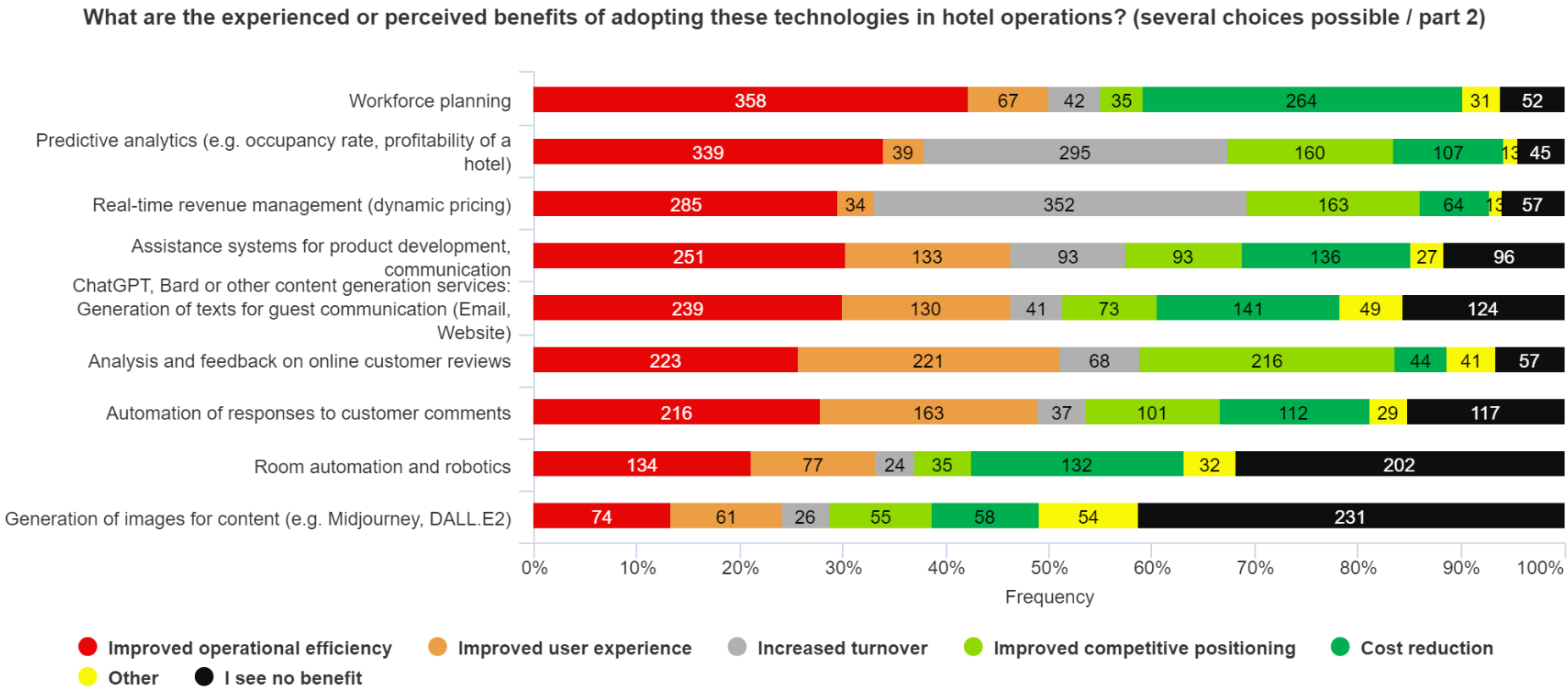
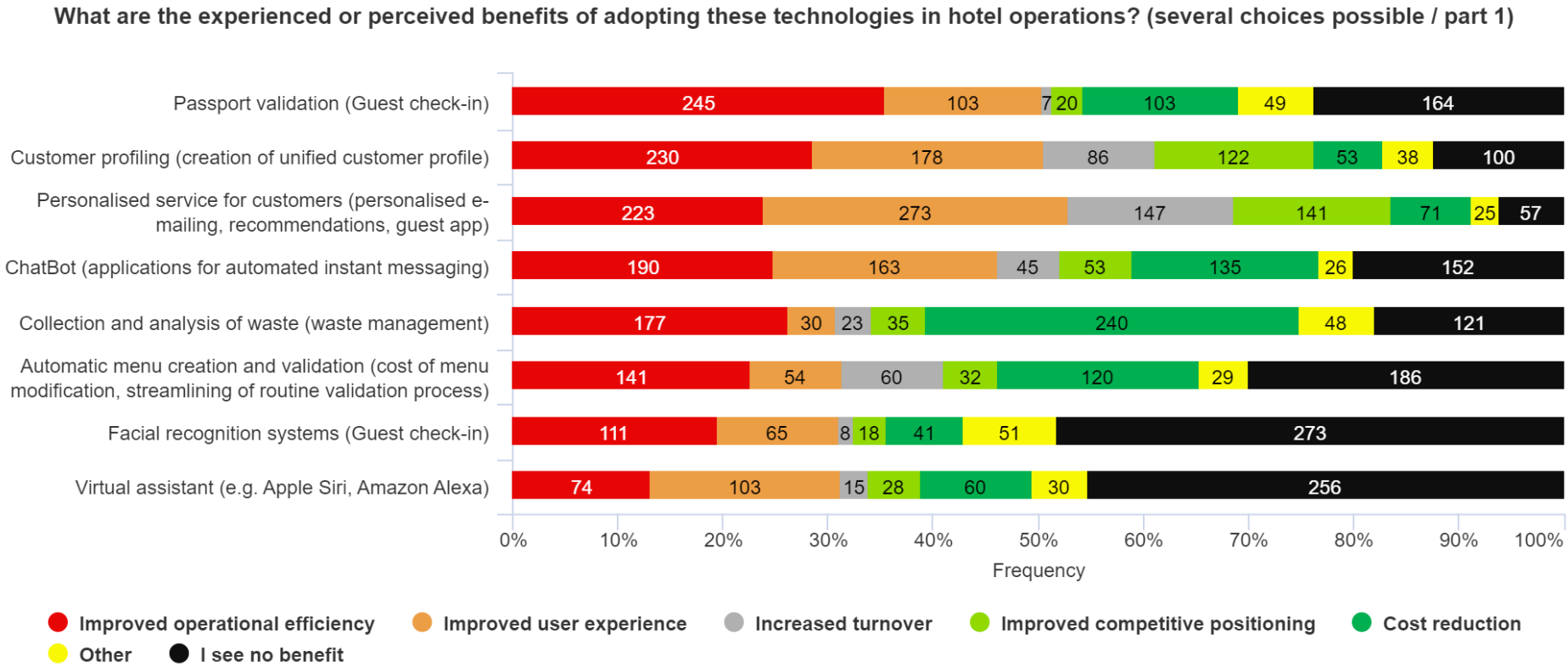
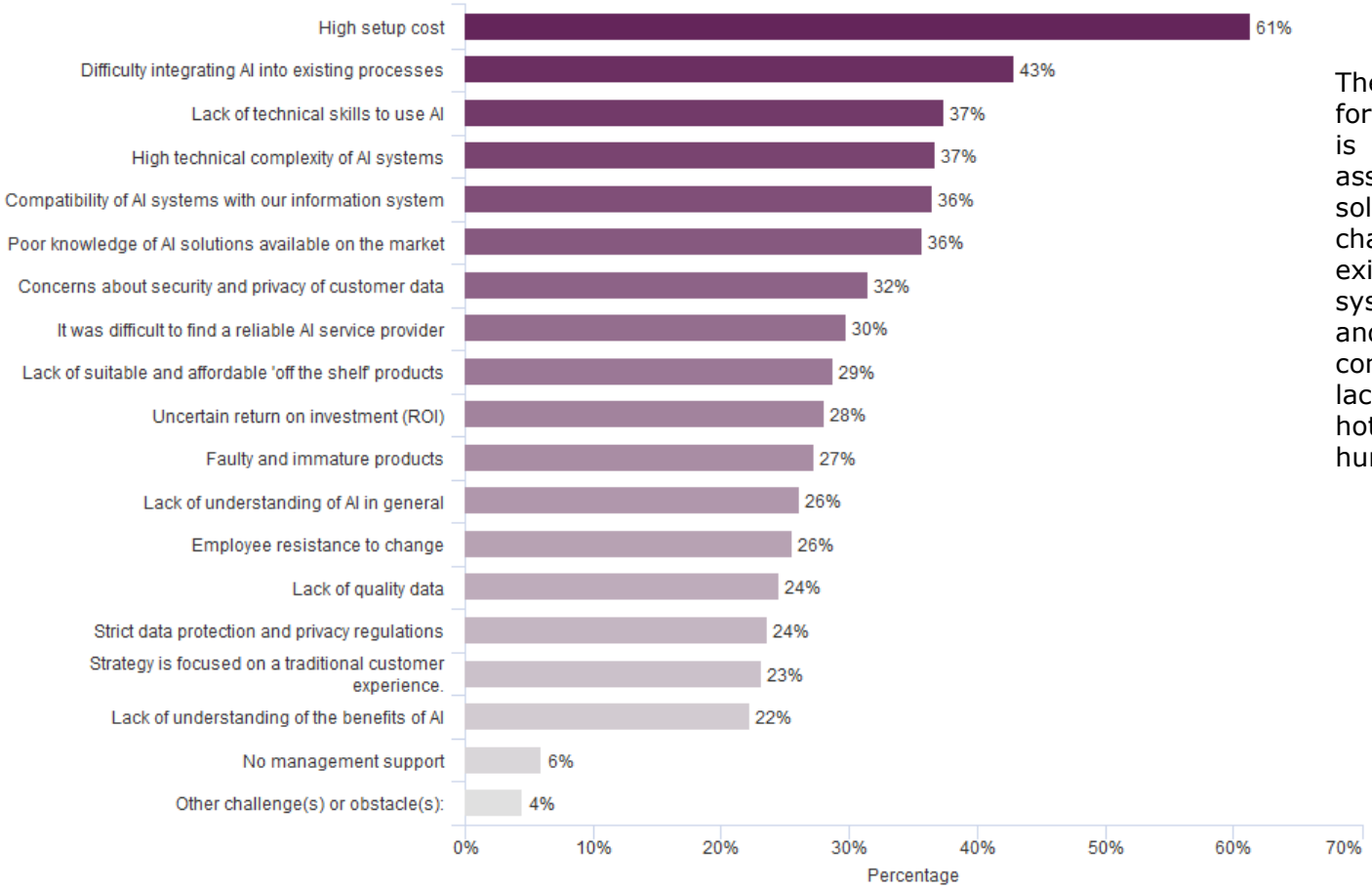
Perceived Benefits of AI technologies (I)



Pereived Benefits of AI technologies (I)

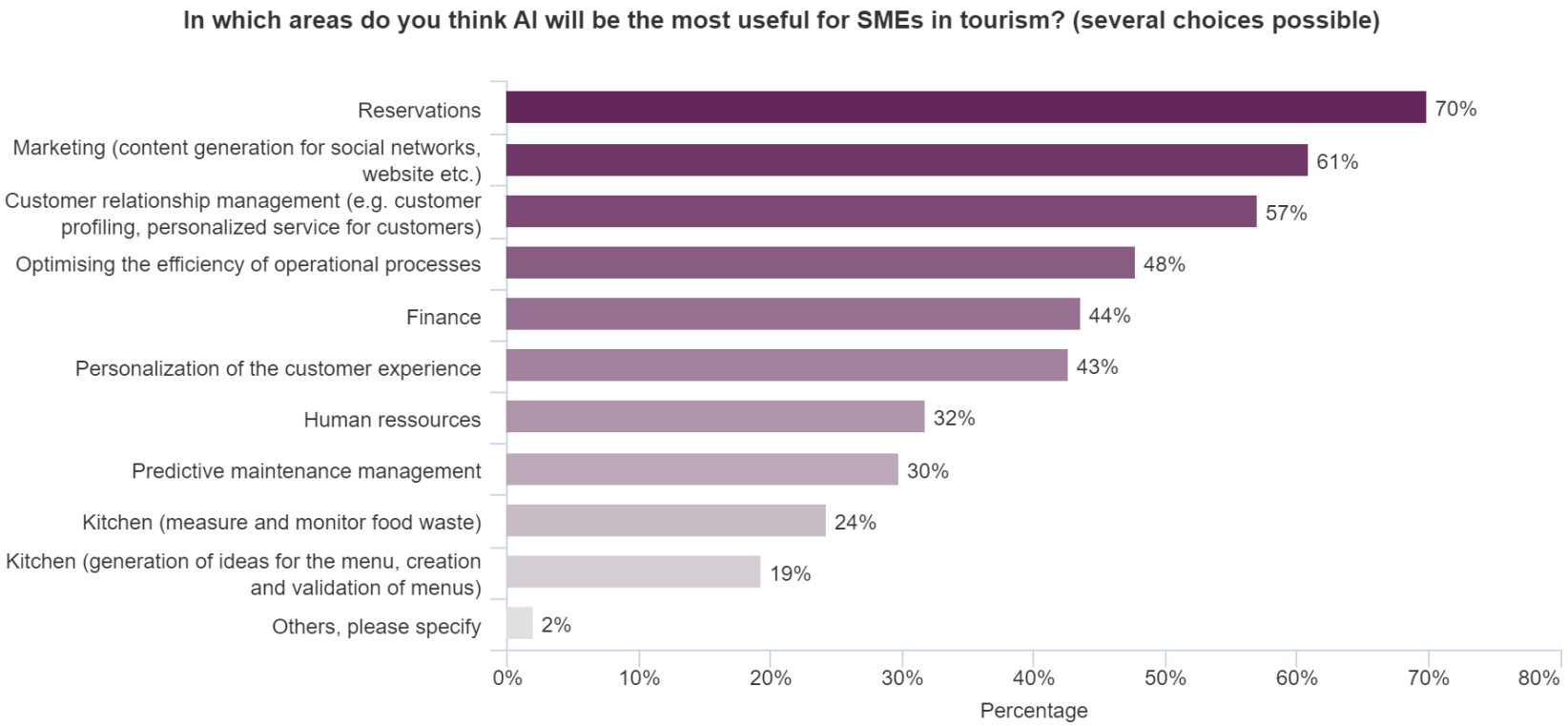


Challenges & Perceived Barriers in AI Integration for Hotel Operations (overall sample)



The primary perceived obstacle for AI adoption across all hotels is the high setup costs associated with AI-based solutions. Additionally, the challenges of integrating AI into existing processes or IT systems, compatibility issues, and the high technical complexity, compounded by a lack of technical skills within the hotels, are viewed as additional hurdles.

Potential AI Impact Areas for SMEs in Tourism



Hotels perceive the primary benefits of AI technologies to be in the domains of reservation (70%), marketing (61%), and CRM (57%). In the back-office, the optimization of operational processes (48%) and finance (44%) are also seen as important application areas, whereas in the front office, the personalization of the customer experience (43%) appears to have considerable potential.

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