E-ISSN: EIKSSN 3141-2254
PRINT-ISSN: 3043-6168

IMPACT OF ARTIFICIAL INTELLIGENCE ON SERVICE DELIVERY EFFICIENCY OF ACCOMMODATION INDUSTRY IN CALABAR METROPOLIS, CROSS RIVER STATE, NIGERIA

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Abstract

Artificial Intelligence (AI) is a development of computer systems capable of performing tasks that typically require human energy and intelligence to execute, AI has emerged as a transformative force in the global accommodation industry, revolutionizing operations, customer interactions, and service efficiency. This examined the impact of artificial intelligence on service delivery efficiency of accommodation industry in Calabar Metropolis, Cross River State, Nigeria. The study employed descriptive survey design, data were gathered from 400 respondents, including managers, staff, and guests across 40 establishments, and analysed using descriptive statistics and analysis of variance (ANOVA). The findings revealed that while the adoption of AI tools such as chatbots, automated booking systems, and predictive maintenance technologies in Calabar's accommodation sector remains at an early stage, there is a positive impact on guest satisfaction and operational efficiency in facilities that have integrated AI-driven solutions. However, challenges such as high implementation costs, limited technical expertise, and infrastructural deficits were observed to impede widespread AI adoption. ANOVA result revealed a significant relationship between AI adoption and service efficiency ($F=2496.088$, $p<0.001$). The study concludes that AI has significant potential to enhance accommodation service delivery in Calabar, provided that stakeholders invest in staff training, infrastructural upgrades, and phased implementation strategies. The study recommends as followed, Management of accommodation businesses should allocate resources toward acquiring cost-

effective AI tools; Hotels owners should invest in continuous staff training on AI systems; and Hotel managers and owners should play a proactive role in championing AI adoption.

Key words: Accommodation industry, artificial intelligence, service, service delivery, guest satisfaction.

Introduction

The rapid advancement of artificial intelligence (AI) has significantly transformed various sectors of the global economy, including healthcare, finance, transportation, and increasingly, the hospitality industry especially the accommodation sector. AI is no longer a futuristic concept but a present-day tool reshaping how services are designed, delivered, and experienced (Lu et al., 2020). The global hospitality sector has adopted AI technologies such as chatbots, virtual assistants, facial recognition, smart room systems, and predictive analytics to streamline operations and enhance customer satisfaction (Ivanov & Webster, 2019). According to PwC (2022), AI has the potential to contribute up to $15.7 trillion to the global economy by 2030, with the service industry, including accommodation, being one of the most affected areas. Accommodation fulfils the essential human requirements of shelter, comfort, and security. As individuals traverse beyond their homes for varied reasons, the inevitability of seeking accommodation arises to assure rest and safety (Akeh & Anake 2025).

Across developed regions such as Europe and Asia, Artificial Intelligence (AI) has transformed hotel operations by automating processes like check-in and check-out, personalizing guest experiences, optimizing pricing, and improving resource management (Tussyadiah, 2020; Buhalis& Leung, 2018). In contrast, AI adoption in Africa's accommodation sector remains gradual but is gaining traction, with countries like South Africa, Kenya, and Nigeria increasingly exploring AI-driven innovations to enhance competitiveness and service delivery (Akinola & Akinsanya, 2022). Despite Nigeria's growing tourism economy and recognition of digital transformation's importance, many hotels, particularly in emerging cities such as Calabar, still struggle with inefficiencies, low customer satisfaction, and limited technological integration (Okon et al., 2023). As a major cultural and tourism hub, especially renowned for Carnival Calabar, the city's accommodation industry stands to benefit significantly from AI adoption to boost operational efficiency, improve guest satisfaction, and strengthen its position in the hospitality sector.

Statement of the Problem

The global accommodation industry is rapidly evolving with the integration of Artificial Intelligence (AI), which enhances operational efficiency, customer engagement, and service quality through innovations such as automated customer service, personalized guest experiences, and smart room technologies (Ivanov & Webster,2019; Tussyadiah, 2020). While developed nations have embraced these advancements, many developing regions, including Nigeria, still experience slow and uneven adoption. Although major cities like Lagos and Abuja are gradually implementing AI in hospitality operations, secondary cities such as Calabar. Despite their rich tourism potential still lag behind due to challenges like inefficient service delivery, poor booking systems, weak customer data management, and inconsistent guest experiences (Okon et al., 2023). These limitations reduce competitiveness, especially during peak tourism events such as the Calabar Carnival. Moreover, there is a lack of empirical research on the level of AI adoption, its impact on service delivery, and barriers to implementation in Calabar's accommodation sector. This study, therefore, aims to fill these gaps by examining the use and effectiveness of AI technologies in enhancing service delivery and identifying obstacles to their broader adoption, ultimately contributing to the growth of a more efficient and technology-driven hospitality industry in Calabar Metropolis. The study was guided by the following objectives:

E-ISSN: EIKSSN 3141-2254
PRINT-ISSN: 3043-6168

1. Examine the level of adoption and application of AI technologies among accommodation providers in Calabar metropolis.
2. Evaluate the impact of AI tools on the quality and efficiency of service delivery in the hospitality sector.
3. Identify the challenges hindering the adoption and effective implementation of AI in accommodation services delivery within Calabar metropolis.

Literature Review

Concept of Artificial Intelligence in Hospitality

Artificial Intelligence (AI) refers to the development of computer systems capable of performing tasks that typically require human intelligence, such as decision-making, problem-solving, learning, and language processing (Russell & Norvig,2021). In the hospitality sector, AI applications have expanded from simple automation to more sophisticated systems capable of anticipating guest needs and optimizing hotel operations (Tussyadiah, 2020). Examples include chatbots, robotic concierge services, intelligent recommendation systems, smart energy control, and facial recognition for check-in/out processes (Buhalis& Leung, 2018). Advancements in machine learning, natural language processing, and robotics have enabled AI to be integrated into various industries, transforming efficiency, productivity, and customer experiences. In particular, AI-driven applications such as predictive analytics, chatbots, and intelligent automation are becoming increasingly prominent across sectors (Jordan & Mitchell, 2015).

Adoption and Application of AI in the Accommodation Industry

Globally, leading hotel brands such as Marriott, Hilton, and Accor have embraced Artificial Intelligence (AI) to enhance operational efficiency, personalize guest experiences, and optimize pricing strategies (Lu et al., 2020). Through AI-driven platforms, hotels can predict customer preferences, provide real-time responses, and implement dynamic pricing models based on demand. In regions like Asia and Europe, AI-powered rooms integrate Internet of Things (IoT) technologies for automated control of lighting, temperature, and entertainment, resulting in cost savings, stronger customer loyalty, and improved competitiveness (Ivanov & Webster,2019). However, in Africa, AI adoption in hospitality remains slow due to infrastructural and financial constraints. While countries such as South Africa, Kenya, and Egypt are making modest progress particularly among luxury hotels. Nigeria's hotel sector largely relies on basic digital tools like online booking systems, with limited implementation of advanced AI applications (Akinola & Akinsanya,2022; Okon et al., 2023).

Impact of AI Tools on the Quality and Efficiency of Service Delivery

Artificial Intelligence (AI) has immense potential to transform service delivery in the hospitality industry by improving speed, accuracy, and personalization. Research indicates that AI enhances customer experience through real-time support, error reduction, and tailored services (Tussyadiah, 2020; Li et al., 2021). Technologies such as chatbots enable faster responses to guest inquiries, while sentiment analysis allows hotels to refine services based on customer feedback. Additionally, AI-powered revenue management tools help managers optimize pricing strategies and forecast demand trends, leading to increased efficiency and profitability (Buhalis& Leung, 2018). Aguiar-Castillo, et al., (2019), further note that AI facilitates predictive analytics and real-time revenue management, maximizing occupancy and improving financial performance. Similarly, Shin & Kang (2020) show that AI supports service personalization by analyzing guest behavior to customize room amenities, dining, and entertainment options an approach more prevalent in advanced economies than in Nigeria, where adoption remains at the level of basic customer management systems.

Nwankwo & Adebayo (2019) found that hotels using AI-based platforms for online booking and mobile check-ins achieved faster service delivery and reduced guest wait times, enhancing overall satisfaction. Eze & Chinedu (2020) observed that AI-enabled customer relationship management (CRM) systems improved guest preference tracking and loyalty program management, fostering repeat patronage, especially among business travelers in major cities like Lagos and Abuja. Likewise, Ogbu & Eze (2020) reported that AI applications in predictive maintenance and energy management have helped luxury hotels monitor electricity use and optimize air conditioning systems, reducing costs while promoting sustainability. These findings collectively demonstrate that even limited AI adoption in Nigeria's hospitality sector contributes significantly to improved service delivery, operational performance, and long-term competitiveness.

Challenges of AI Implementation in Accommodation industry

Despite the numerous advantages of Artificial Intelligence (AI) in enhancing hospitality operations, its implementation, particularly in developing countries faces multiple challenges. High installation and maintenance costs, limited technical expertise, resistance to technological change, inadequate infrastructure, and fears of job loss hinder widespread adoption (Gretzel, 2021; Akinola & Akinsanya, 2022). In Nigeria, these challenges are exacerbated by unreliable power supply, low internet penetration, and weak regulatory frameworks (Okon et al., 2023). Additionally, cultural perceptions that value human interaction over automation often lead to guest skepticism toward AI-driven services. Although global research has examined AI in hospitality extensively, few empirical studies focus on local contexts like Calabar. This gap highlights the need for context-specific investigations into the readiness, experiences, and challenges of AI adoption among accommodation providers and users in Calabar's hospitality sector.

Globally, cost remains one of the most significant barriers to AI implementation (Kaplan & Haenlein 2019), and this is even more pronounced in Nigeria, where unstable economic conditions and high capital requirements deter investment. Technological incompatibility also limits adoption, as many hotels rely on outdated systems not suited for AI integration (Dwivedi et al., 2021). Furthermore, poor ICT infrastructure, weak internet connectivity, and erratic power supply, particularly outside major cities, further constrain progress (Ogbu & Eze 2020). Beyond infrastructural challenges, customer acceptance is uneven; cultural preferences for personal, human-centered service discourage full automation (Adeola & Evans, 2020; Wirtz et al., 2018). Policy and regulatory gaps especially concerning data protection and cybersecurity also create uncertainty, discouraging adoption (Okolie &Osabuohien, 2021). Finally, a shortage of skilled personnel poses a major obstacle, as many hotel employees lack the technical expertise to manage AI systems effectively. This situation, combined with fears of job displacement, contributes to resistance among staff, resulting in underutilization of AI technologies even in hotels where they are available (Eze & Chinedu, 2020).

Methodology

This study adopts a descriptive survey research design. The design enables the collection of both qualitative and quantitative data from a targeted population, providing a comprehensive understanding of the phenomena under study. The target population includes managers, staff, and selected guests of registered accommodation providers in Calabar metropolis. These stakeholders are directly involved in or affected by the use of service technologies, making them relevant respondents for the study. Sample Size was determined using Taro Yamane's formula (Yamane, 1967). The study drew a total sample of 400 respondents across 40 accommodation establishments in the study area. A purposive sampling technique was adopted for this study. Purposive sampling refer to a group of non-

probability sampling techniques in units are selected because they have characteristics that a researcher need to sample, the units are selected "on purpose" in purposive sampling.

Study Area

The study is situated in Calabar Metropolis, the capital of Cross River State, Nigeria, renowned for its rich cultural heritage, vibrant hospitality sector, and globally acclaimed Calabar Carnival. The metropolis encompasses Calabar Municipal and Calabar South Local Government Areas, covering approximately 274.6 km² and located between latitudes 4˚50'N–5˚10'N and longitudes 8˚17'E–8˚20'E. Bordered by the Great Kwa River to the east and the Calabar River to the west, the city is home to an estimated population of about 375,000 people.

Result Presentation and Discussion

Table 1 shows that only 24.25 percent of hotels have fully adopted AI technologies, while a higher proportion 28.50 percent are still at the stage of partial adoption. A considerable percentage 23.50 percent is planning to adopt AI, whereas 23.75 percent have not adopted it at all. This indicates that although awareness of AI exists, full integration is still relatively low. The implication is that AI in the accommodation sector of Calabar is still in its early growth stage, suggesting opportunities for expansion and investment.

Table 1: AI technology adoption status in accommodation service delivery

Option	Frequency	Percentage (%)
Yes, fully adopted	97	24.25
Partially adopted	114	28.50
Planning to adopt	94	23.50
Not adopted at all	95	23.75
Total	400	100

Source: Author's fieldwork, 2025.

In terms of the specific AI tools in use in accommodation as shown in Table 2, results reveal that 25.75 percent of hotels use smart room systems, 25.50 percent use facial recognition or keyless entry, and 24.50 percent deploy chatbots or virtual assistants, while 24.25 percent reported not using any AI tools. This suggests that technology application is fairly balanced, with smart room systems slightly leading, reflecting gradual efforts by hotels to improve guest experiences through automation.

Table 2: AI tools currently in use in accommodation in the study area

Option	Frequency	Percentage (%)
Chatbots/Virtual Assistants	98	24.50
Smart Room Systems	103	25.75
Facial Recognition or Keyless Entry	102	25.50
None of the above	97	24.25
Total	400	100

Source: Author's fieldwork, 2025.

Figure 1 further reveals the level of awareness of AI technologies among hotels. A significant proportion of respondents reported very high awareness 26.75 percent, while an equal number 26.75 percent indicated low awareness. This duality shows a divided landscape some hotels are well-informed about AI potential, while others remain less knowledgeable. About 21.75 percent reported moderate awareness, and 24.75 percent admitted being completely unaware. This disparity implies that while some hotels are moving ahead technologically, others risk lagging behind.

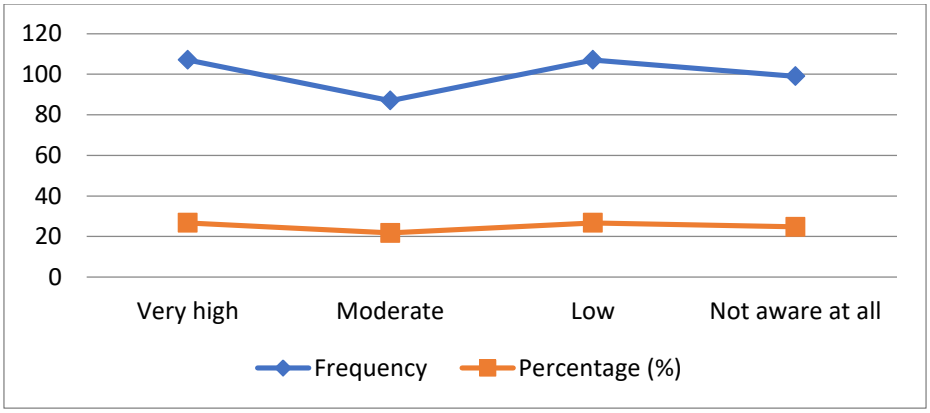

FIG.1: Hotel's level of awareness about AI
Source: Author's fieldwork, 2025.

The findings in Table 3 indicate that AI has contributed positively to service efficiency. About 26.0 percent of respondents reported that AI greatly improved the speed of service delivery, while 23.50 percent reported slight improvements. However, 25.50 percent indicated no change, and 25.0 percent even reported reduced inefficiency. This mixed result suggests that although AI enhances service speed, its effectiveness largely depends on proper integration and management

Table 3: Effect of AI on speed of service delivery

Option	Frequency	Percentage (%)
Greatly improved	104	26.00
Slightly improved	94	23.50
No change	102	25.50
Reduced inefficiency	100	25.00
Total	400	100

Source: Author's fieldwork, 2025.

Figure 2 presents the effect of AI on staff workload. Results show a divided perspective: 26.50 percent reported significant workload reduction, while 26.75 percent claimed it increased workload. Meanwhile, 24.75 percent observed a slight reduction and 22.0 percent indicated no impact. This finding highlights the complex relationship between AI and staff efficiency: while AI can automate routine tasks, poor implementation or inadequate training may shift additional responsibilities to employees.

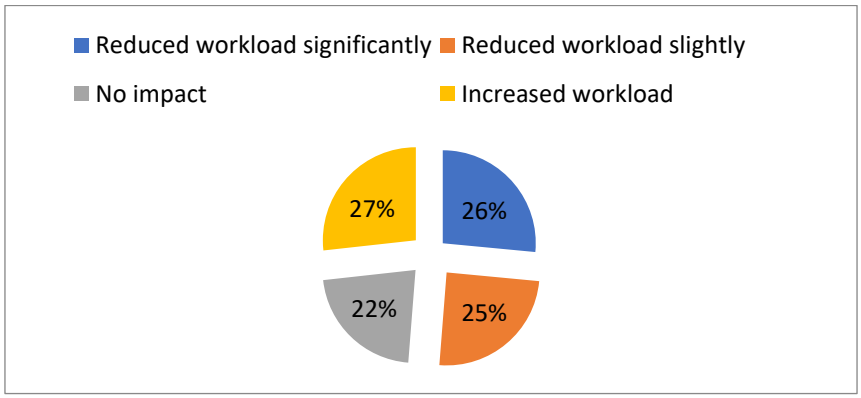

FIG. 2: AI influence on staff workload
Source: Author's fieldwork, 2025.

E-ISSN: EIKSSN 3141-2254
PRINT-ISSN: 3043-6168

The challenges hindering AI adoption and use in accommodation sectors

The study also reveals several challenges limiting AI adoption. As shown in Table 7, 27.25 percent identified high costs of technology as the biggest barrier, while 26.75 percent cited lack of technical expertise. Staff resistance 23.0 percent and poor infrastructure 23.0 percent were also key obstacles. This indicates that financial and technical limitations remain critical barriers to AI adoption in Calabar's hospitality sector.

Table 5: Main barrier to AI adoption in accommodation businesses

Option	Frequency	Percentage (%)
High cost of technology	109	27.25
Lack of technical expertise	107	26.75
Resistance from staff	92	23.00
Poor infrastructure (e.g., power, internet)	92	23.00
Total	400	100

Source: Author's fieldwork, 2025.

Figure 3 highlights hotels' biggest concerns about AI usage. The leading issues were cost of maintenance 29.25 percent and job losses 26.50 percent, followed by data privacy/security 25.50 percent and lack of guest acceptance 18.75 percent. These results suggest that beyond adoption challenges, fears about economic, social, and ethical implications of AI play a significant role in slowing down its diffusion.

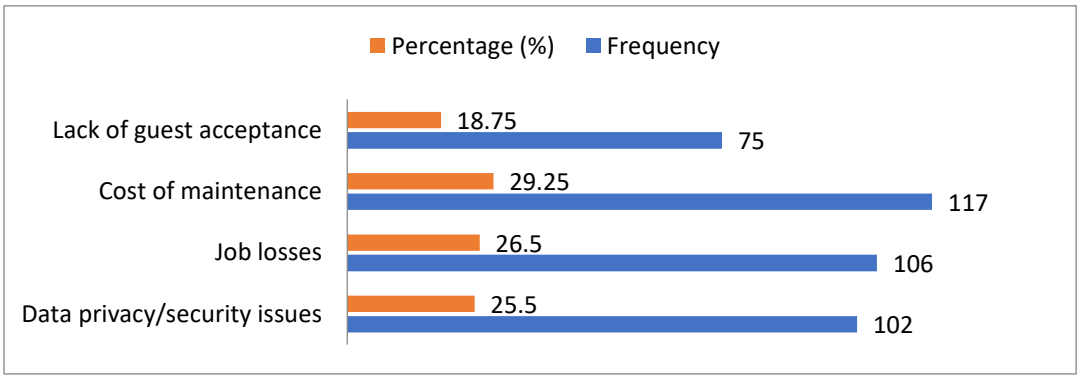

Fig. 3: Hotel's biggest concern about using AI
Source: Author's fieldwork, 2025.

The output from the ANOVA result presented table 6 showed that there is highly significant F-value of 2496.088 indicates that AI adoption impacts service delivery speed and efficiency. Since the P-value is 0.000 which is less than 0.05 level of significant. Therefore, the null hypothesis was rejected while the alternate hypothesis was accepted hence there sufficient statistical evidence to conclude that the adoption of AI technology has a significant impact on efficient service delivery in the accommodation industry.

Table 6: ANOVA: Effect of AI on efficiency of service delivery in accommodation industry

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	482.464	3	160.821	2496.088	.000
Within Groups	25.514	396	.064		
Total	507.978	399			

Discussion of Results

Level of Adoption and Application of AI Technologies

Table 1 shows that only 24.25 percent of hotels have fully adopted AI technologies, while a higher proportion 28.50 percent are still at the stage of partial adoption. A considerable percentage 23.50 percent is planning to adopt AI, whereas 23.75 percent have not adopted it at all. This indicates that although awareness of AI exists, full integration is still relatively low. The implication is that AI in the accommodation sector of Calabar is still in its early growth stage, suggesting opportunities for expansion and investment. In terms of the specific AI tools in use (Table 2), results reveal that 25.75 percent of hotels use smart room systems, 25.50 percent use facial recognition or keyless entry, and 24.50 percent deploy chatbots or virtual assistants, while 24.25 percent reported not using any AI tools. This suggests that technology application is fairly balanced, with smart room systems slightly leading, reflecting gradual efforts by hotels to improve guest experiences through automation. Figure 1, further reveals the level of awareness of AI technologies among hotels. A significant proportion of respondents reported very high awareness 26.75 percent, while an equal number 26.75 percent indicated low awareness. This duality shows a divided landscape some hotels are well-informed about AI potential, while others remain less knowledgeable. About 21.75 percent reported moderate awareness, and 24.75 percent admitted being completely unaware. This disparity implies that while some hotels are moving ahead technologically, others risk lagging behind. The findings aligned with study of (Tussyadiah, 2020; Li et al., 2021).

Impact of AI on Service Delivery and Efficiency in accommodation businesses

The findings in Table 3 indicate that AI has contributed positively to service efficiency. About 26.0 percent of respondents reported that AI greatly improved the speed of service delivery, while 23.50 percent reported slight improvements. However, 25.50 percent indicated no change, and 25.0 percent even reported reduced efficiency. This mixed result suggests that although AI enhances service speed, its effectiveness largely depends on proper integration and management. With regard to guest satisfaction (Table 5), the majority of hotels observed moderate to slight improvements 25.25 percent and 29.50 percent, respectively. Meanwhile, 20.50 percent reported highly improved satisfaction, while 24.75 percent noted no improvement. This findings is consonant with the study of Eze & Chinedu (2020). This suggests that while AI enhances personalized services and convenience, its overall impact on guest satisfaction may be constrained by limited adoption and technical issues. This finding highlights the complex relationship between AI and staff efficiency: while AI can automate routine tasks, poor implementation or inadequate training may shift additional responsibilities to employees.

Challenges Hindering AI Adoption and Use in accommodation sector

The study also reveals several challenges limiting AI adoption. As shown in Table 7, 27.25 percent identified high costs of technology as the biggest barrier, while 26.75 percent cited lack of technical expertise. Staff resistance 23.0 percent and poor infrastructure 23.0 percent were also key obstacles. This indicates that financial and technical limitations remain critical barriers to AI adoption in Calabar's hospitality sector. Management support for AI adoption is also weak. Table 8 shows that only 20.75 percent of hotel management is very supportive and 20.50 percent somewhat supportive. However, the majority were indifferent 28.50 percent or not supportive 30.25 percent. This lack of managerial commitment is likely to hinder long-term technological transformation. Finally, Table 9 highlights hotels' biggest concerns about AI usage. The leading issues were cost of maintenance 29.25 percent and job losses 26.50 percent, followed by data privacy/security 25.50 percent and lack of guest acceptance 18.75 percent. The study aligned with findings of (Gretzel, 2021; Akinola &

Akinsanya, 2022). These results suggest that beyond adoption challenges, fears about economic, social, and ethical implications of AI play a significant role in slowing down its diffusion.

Conclusion and Recommendations

The study concludes that while AI offers significant potential to transform the accommodation industry in Calabar metropolis, its adoption remains limited and uneven. Hotels that have embraced AI report some improvements in service delivery, customer satisfaction, and operational efficiency, but these benefits are constrained by systemic and organizational barriers. The hospitality sector in Calabar reflects a transitional phase in technological innovation where awareness and interest exist, but practical adoption is hindered by financial, infrastructural, and managerial challenges. Therefore study recommend as follow:

1. Management of accommodation businesses should allocate resources toward acquiring cost-effective AI tools, beginning with low-cost but high-impact solutions such as chatbots and smart room automation.
2. Hotels owners should invest in continuous staff training to ensure employees are well-equipped to operate and maintain AI systems.
3. Hotel managers and owners should play a proactive role in championing AI adoption by fostering a positive attitude toward technological innovation and reducing resistance to change among staff.

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