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TRANSFORMING HOTEL OPERATIONS THROUGH AI-BASED PROPERTY MANAGEMENT SYSTEMS IMPLICATIONS FOR THE U.S. HOSPITALITY INDUSTRY

Nudrat Fariha[1]*, Abeera Rahman[2]

[1] *University of Bridgeport, Department- Business Analytics, United States.*
[2] *Widener University, Bachelor of Science in Businesses Analytics, United states.*

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Corresponding author: Nudrat Fariha (nfariha@my.bridgeport.edu)

ABSTRACT

Purpose: The purpose of this study is to examine how artificial intelligence (AI)–based Property Management System (PMS) functional capability and AI-enabled decision-support quality influence hotel operational performance in the U.S. hospitality industry. The study further investigates the mediating role of operational efficiency and the moderating role of employee AI readiness in explaining AI-driven performance outcomes. Design/Methodology/Approach: The study adopts a quantitative, explanatory research design using a cross-sectional survey approach. Data were collected from 450 managerial- and supervisory-level employees working in U.S. hotels that have implemented AI-based PMS solutions. Structural Equation Modeling (PLS-SEM) using Smart PLS 4 was employed to assess the measurement model and test direct, mediating, and moderating relationships. Findings: The results indicate that AI-based PMS functional capability and AI-enabled decision-support quality have significant positive effects on hotel operational performance. Operational efficiency was found to partially mediate the relationship between AI-enabled decision-support quality and performance and weakly mediate the relationship between AI-based PMS capability and performance. Employee AI readiness significantly moderates the relationship between AI-based PMS capability and hotel operational performance, but does not moderate the relationship between AI-enabled decision-support quality and performance. Theoretical Implications: The study extends the Resource-Based View, Dynamic Capabilities Theory, and Socio-Technical Systems Theory by providing an integrated empirical model explaining AI-driven value creation in hospitality operations. Practical Implications: The findings highlight the importance of aligning AI-based PMS investments with process optimization and workforce readiness initiatives to achieve sustainable operational performance improvements. Originality/Value: This study offers one of the few empirically validated models integrating technological, operational, and human factors in explaining AI-based PMS performance outcomes in the U.S. hospitality industry.

KEYWORDS: Artificial intelligence; Property management systems; Operational efficiency; Employee AI readiness; Hotel operational performance; U.S. hospitality industry

1. INTRODUCTION

The hospitality industry is experiencing a significant phase of digital transformation as hotels increasingly integrate artificial intelligence (AI)–based Property Management Systems (PMS) to improve operational efficiency, managerial decision-making, and guest experience in a highly competitive and technology-intensive market. Conventional PMS platforms, which were historically designed to handle basic front-office operations such as reservations and billing, have evolved into advanced AI-enabled systems capable of supporting real-time inventory management, dynamic pricing, predictive analytics, and integrated customer relationship management (Bouchareb et al., 2023) (Bouchareb, 2023; Kaul, 2018). Recent empirical and conceptual studies highlight that AI-driven PMS enhance hotels' ability to optimize revenue, reduce operational costs, and deliver personalized services, thereby strengthening overall operational performance, particularly in developed hospitality markets such as the United States (Milton, 2024; Tan et al., 2025). However, existing literature also emphasizes that the successful realization of these benefits is not solely dependent on technological capability but is significantly shaped by organizational and human factors, including employee readiness, digital skills, and acceptance of AI systems, as explained by socio-technical systems theory (Ruel & Njoku, 2021; Tan et al., 2025). Despite growing adoption of AI-based PMS, there remains limited integrated empirical evidence explaining how AI capabilities translate into performance outcomes through operational efficiency, especially under moderating conditions such as employee AI readiness. This gap highlights the need for a structured investigation into the relationships among AI-based PMS capabilities, operational efficiency, and hotel operational performance within the context of the U.S. hospitality industry.

Despite the rapid adoption of artificial intelligence (AI)–based Property Management Systems (PMS) across the hospitality industry, hotels—particularly in the U.S. context—continue to face uncertainty regarding how these advanced technologies translate into tangible operational performance outcomes. While prior studies acknowledge that AI-based PMS functional capabilities and AI-enabled decision-support systems can enhance pricing accuracy, inventory control, and managerial effectiveness, empirical evidence remains fragmented on whether and how these technological capabilities improve hotel operational performance through internal efficiency mechanisms (Bouchareb, 2023; Kaul, 2018; Milton, 2024). Moreover, existing research often treats operational efficiency as a direct outcome rather than examining its mediating role in explaining the relationship between AI-based PMS and performance indicators such as service quality, guest satisfaction, and revenue outcomes (Tan et al., 2025). Compounding this gap, recent hospitality literature emphasizes that the success of AI implementation is highly contingent on human and organizational factors, particularly employee AI readiness, which may strengthen or weaken the effectiveness of AI-driven systems but is rarely modeled as a moderating variable in PMS research (Ruel & Njoku, 2021; Tan et al., 2025). Consequently, hotels risk underutilizing AI-based PMS investments due to misalignment between technological capabilities, operational processes, and workforce readiness. This unresolved issue underscores the need for an integrated empirical investigation that simultaneously examines the effects of AI-based PMS functional capability and AI-enabled decision-support quality on hotel operational performance, the mediating role of operational efficiency, and the moderating influence of employee AI readiness within the U.S. hospitality industry.

Although prior studies have extensively examined the adoption of artificial intelligence (AI) in the hospitality industry, the existing literature reveals several critical gaps concerning AI-based Property Management Systems (PMS). Most studies focus on isolated applications of AI—such as dynamic pricing, chatbots, or inventory management—without offering an integrated empirical framework that explains how AI-based PMS functional capabilities and AI-enabled decision-support quality collectively influence hotel operational performance (Bouchareb, 2023; Milton, 2024). Additionally, operational efficiency is frequently treated as a direct outcome of AI adoption rather than being empirically tested as a mediating mechanism that explains how AI-driven PMS capabilities translate into improved service quality, revenue performance, and guest satisfaction (Kaul, 2018; Tan et al., 2025). Furthermore, while recent hospitality research increasingly highlights the importance of human and organizational factors in digital transformation, employee AI readiness has been largely underexplored as a moderating variable that may condition the effectiveness of AI-based PMS implementations (Ruel & Njoku, 2021; Tan et al., 2025). This gap is particularly evident in the U.S. hospitality context, where labor shortages, rising operational costs, and rapid technological change intensify the need for alignment between AI systems and workforce capabilities. Consequently, there is a lack of comprehensive empirical evidence that simultaneously examines technological, operational, and human dimensions within a unified model, underscoring the need for the present study.

The value of this study lies in its integrated examination of technological, operational, and human dimensions of artificial intelligence (AI)–based Property Management Systems (PMS), offering both academic and managerial relevance for the hospitality industry. The primary aim of the study is to empirically investigate how AI-based PMS functional capability and AI-enabled decision-support quality influence hotel operational performance through the mediating role of operational efficiency, while accounting for the moderating effect of employee AI readiness. From a general perspective, the study contributes to the growing body of digital transformation and hospitality technology literature by advancing a holistic framework grounded in socio-technical systems theory, thereby moving beyond fragmented, application-specific analyses of AI adoption (Bouchareb, 2023; Tan et al., 2025). From a management standpoint, the purpose of the study is to provide evidence-based insights that help hotel managers and decision-makers better align AI investments with operational processes and workforce capabilities, ensuring that technological adoption translates into measurable performance outcomes such as improved service quality, cost efficiency, and revenue performance (Milton, 2024; Ruel & Njoku, 2021). By clarifying the conditions under which AI-based PMS delivers value, the study supports strategic decision-making, resource allocation, and change management initiatives in the U.S. hospitality sector, where competitive pressure, labor constraints, and rising guest expectations demand more intelligent and efficient operational models.

The novelty of this study is reflected in its integrative research model that simultaneously examines the effects of AI-based PMS functional capability and AI-enabled decision-support quality on hotel operational performance through the mediating role of operational efficiency and the moderating influence of employee AI readiness. Unlike prior studies that focus on individual AI applications or treat AI adoption as a purely technological phenomenon, this study conceptualizes AI-based PMS as a socio-technical system embedded within organizational processes and workforce dynamics (Bouchareb, 2023; Milton, 2024). By empirically incorporating employee AI readiness as a moderating variable, the study responds to recent calls for greater attention to human factors in hospitality AI research and extends socio-technical systems theory within the PMS context (Ruel & Njoku, 2021; Tan et al., 2025). Additionally, the focus on the U.S. hospitality industry adds contextual originality, addressing an underexplored setting characterized by labor constraints, high operational costs, and rapid AI adoption, thereby offering new theoretical insights and practical guidance on how AI-based PMS can generate sustainable operational value.

Table 1: Evidence of Research Gap and Future Research Directions in AI-Based Property Management Systems

Aspect	Evidence from Existing Literature	Identified Gap	Future Research Direction	Key Citations
AI-based PMS functional capability	Studies confirm that AI-enabled PMS improves reservations, dynamic pricing, inventory control, and analytics efficiency, but focus mainly on individual system functions	Lack of integrated models linking PMS capabilities to overall hotel performance	Examine AI-based PMS as a holistic operational system rather than isolated functions	Bouchareb (2023); Kaul (2018); Milton (2024)
AI-enabled decision-support quality	Research shows AI improves forecasting accuracy and managerial decision-making	Decision-support quality is rarely modeled as an independent performance driver	Empirically test decision-support quality as a strategic predictor of performance	Milton (2024); Tan et al. (2025)
Operational efficiency	Frequently cited as an outcome of AI adoption	Limited empirical testing of operational efficiency as a mediating mechanism	Test operational efficiency as a mediator between AI-based PMS and performance	Kaul (2018); Tan et al. (2025)
Employee AI readiness	Literature highlights the importance of workforce skills and AI acceptance	Rarely examined as a moderating variable in PMS studies	Incorporate employee AI readiness as a moderating factor	Ruel & Njoku (2021); Tan et al. (2025)
Hotel operational performance	Performance measured using service quality, revenue metrics, and guest satisfaction	Fragmented performance measures without unified explanatory models	Develop integrated performance models using financial and non-financial indicators	Bouchareb (2023); Milton (2024)
Research context	Most studies focus on global or non-U.S. hospitality markets	Limited empirical evidence specific to U.S. hotels	Conduct context-specific studies in the U.S. hospitality industry	Tan et al. (2025); Ruel & Njoku (2021)
Methodological approach	Predominantly conceptual or cross-sectional studies	Lack of advanced empirical and longitudinal designs	Apply SEM, PLS-SEM, and longitudinal or mixed-method approaches	Tan et al. (2025); Milton (2024)

The need to conduct this study is further reinforced by the critical role of the hospitality industry in the United States economy, where hotels and related services represent a major source of employment, revenue generation, and economic resilience. Recent industry reports indicate that the U.S. hospitality and tourism sector contributes trillions of dollars annually to national GDP and supports millions of jobs, making operational efficiency and performance sustainability a strategic economic priority rather than a firm-level concern alone (World Travel & Tourism Council, 2024; Statista, 2024). At the same time, U.S. hotels are facing intensified pressures arising from labor shortages, escalating operating costs, post-pandemic demand volatility, and increasingly sophisticated guest expectations, all of which have accelerated investments in artificial intelligence (AI)–based Property Management Systems (PMS) as a means of maintaining competitiveness (Milton, 2024; Tan et al., 2025). However, existing research suggests that the economic value of AI adoption is not automatic, as performance gains depend on how AI-based PMS capabilities are translated into operational efficiency and supported by employee readiness and organizational alignment (Ruel & Njoku, 2021; Bouchareb, 2023). Studying these relationships is therefore important not only for advancing hospitality and technology management scholarship but also for informing managerial and policy decisions in an industry that plays a pivotal role in U.S. economic growth, workforce stability, and service-sector productivity.

The significance of this study lies in its comprehensive contribution to both academic scholarship and managerial practice by clarifying how artificial intelligence (AI)–based Property Management Systems (PMS) create operational value in the hospitality industry through an integrated technological, operational, and human-centered perspective. By empirically linking AI-based PMS functional capability and AI-enabled decision-support quality with hotel operational performance through the mediating role of operational efficiency and the moderating effect of employee AI readiness, the study advances hospitality management and information systems literature beyond fragmented, application-focused analyses of AI adoption (Bouchareb, 2023; Tan et al., 2025). The research contributes theoretically by extending socio-technical systems theory into the PMS context, demonstrating that performance outcomes depend on the alignment of technology, processes, and workforce capabilities rather than technology alone (Ruel & Njoku, 2021). From a practical standpoint, the findings will benefit hotel owners, general managers, and operations executives by providing evidence-based guidance on how to maximize returns on AI-based PMS investments, improve operational efficiency, and enhance service quality and revenue performance (Milton, 2024). Additionally, the study offers value to policymakers and industry associations by generating insights relevant to workforce development, digital transformation strategies, and productivity enhancement in an industry that plays a vital role in the U.S. economy. Finally, technology providers and system developers may benefit from the study by gaining a clearer understanding of user readiness and operational requirements, enabling the design of more effective and user-centered AI-based PMS solutions.

It is particularly interesting to examine the relationships among AI-based PMS functional capability, AI-enabled decision-support quality, operational efficiency, employee AI readiness, and hotel operational performance because these variables collectively capture the technological, process-oriented, and human dimensions of digital transformation in hospitality. Existing studies tend to analyze these elements in isolation, yet recent literature suggests that the true value of AI in hotels emerges from the interaction between advanced system capabilities and the organizational context in which they are deployed (Bouchareb, 2023; Milton, 2024). The uniqueness of studying these relationships together lies in the ability to explain not only whether AI-based PMS improves performance, but also how this improvement occurs through operational efficiency and under what conditions it is strengthened or weakened by employee readiness to work with AI systems, consistent with socio-technical systems theory (Ruel & Njoku, 2021; Tan et al., 2025). This relational perspective is especially relevant in the U.S. hospitality industry, where high labor dependency, rising costs, and intense competition make it essential to understand the interplay between intelligent technologies and workforce capabilities rather than treating AI adoption as a purely technical intervention. By jointly examining direct, mediating, and moderating relationships, the study offers a more nuanced and insightful understanding of AI-based PMS value creation that has been largely absent from prior hospitality research.

2. LITERATURE REVIEW:

2.1. Theoretical Foundation

The theoretical foundation of AI-based PMS functional capability and AI-enabled decision-support quality is primarily grounded in the Resource-Based View (RBV) and Dynamic Capabilities Theory. From the RBV perspective, AI-based PMS represents a strategic technological resource that is valuable, rare, and difficult to imitate when effectively integrated into hotel operations,

enabling firms to achieve superior operational performance and competitive advantage (Barney, 1991; Milton, 2024). AI-enabled decision-support quality further extends this logic by enhancing managerial cognition and analytical capacity, allowing hotels to sense, seize, and respond to market changes more effectively through data-driven insights, predictive analytics, and real-time operational intelligence. Dynamic Capabilities Theory supports this view by emphasizing that it is not merely the possession of advanced AI technologies, but the organization's ability to reconfigure and deploy these capabilities in response to environmental uncertainty that drives sustained performance improvements in hospitality settings (Teece, 2018; Tan et al., 2025). Together, these theories justify why AI-based PMS capabilities and decision-support quality function as key independent variables influencing hotel outcomes.

The mediating role of operational efficiency is theoretically supported by the Service-Profit Chain theory and Process Management theory. The Service-Profit Chain posits that internal service quality and efficient operational processes directly influence service delivery, customer satisfaction, and ultimately organizational performance (Heskett et al., 1994). In the context of AI-based PMS, operational efficiency reflects the extent to which intelligent systems streamline workflows, reduce errors, and optimize resource utilization, thereby translating technological inputs into tangible performance outcomes. Process Management theory further reinforces this mechanism by suggesting that technology-driven process automation and integration enhance coordination and reduce inefficiencies across operational activities, making operational efficiency a critical pathway through which AI-based PMS impacts hotel operational performance (Hammer, 2015; Bouchareb, 2023). This theoretical grounding explains why operational efficiency is best positioned as a mediating variable rather than a direct outcome of AI adoption.

The moderating role of employee AI readiness and the dependent construct of hotel operational performance are jointly anchored in Socio-Technical Systems Theory and Human Capital Theory. Socio-Technical Systems Theory argues that organizational performance emerges from the alignment between technological systems and the social system, including employee skills, attitudes, and readiness to work with advanced technologies (Trist & Bamforth, 1951; Ruel & Njoku, 2021). Employee AI readiness therefore moderates the effectiveness of AI-based PMS by shaping how well employees adopt, trust, and utilize AI-driven insights in daily operations. Human Capital Theory complements this perspective by emphasizing that employee knowledge, digital competence, and adaptability enhance the productivity returns of technological investments, ultimately influencing hotel operational performance outcomes such as service quality, efficiency, and revenue generation (Becker, 1993; Tan et al., 2025). These theoretical lenses collectively justify examining employee AI readiness as a moderating condition and hotel operational performance as the ultimate outcome variable in the proposed research model.

2.2. *AI-Based Property Management System Functional Capability*

AI-based Property Management System functional capability refers to the extent to which a hotel's PMS integrates advanced artificial intelligence functionalities to manage, automate, and optimize core operational activities. Recent literature defines AI-based PMS as an intelligent, data-driven platform that leverages machine learning, predictive analytics, and real-time data processing to support reservations, channel management, inventory control, dynamic pricing, and customer relationship management in an integrated manner (Bouchareb, 2023; Milton, 2024). Unlike traditional PMS, AI-based systems are characterized by their ability to learn from historical and real-time data, continuously improve operational accuracy, and support proactive rather than reactive management decisions, making them a critical technological capability in modern hospitality operations (Tan et al., 2025).

Initially defined as a back-office information system designed primarily for reservation handling, billing, and record keeping, Property Management Systems were largely transactional and compliance-oriented in nature, focusing on operational control rather than strategic value creation (Kasavana & Brooks, 2005). Over time, as digitalization accelerated, PMS capabilities expanded to include cloud-based integration, channel management, and basic analytics, shifting the focus from administrative efficiency to operational coordination across hotel departments (Kaul, 2018). More recently, the concept has evolved into AI-based PMS functional capability, characterized by machine learning, predictive analytics, real-time data integration, and adaptive system intelligence that supports proactive decision-making and service personalization (Bouchareb, 2023; Milton, 2024). This evolution reflects a sectoral shift in hospitality from technology as a support tool to technology as a strategic operational capability, with PMS now viewed as a core digital infrastructure that enables competitive advantage rather than merely ensuring transactional accuracy (Tan et al., 2025).

AI-based Property Management System functional capability plays a central role in organizational functioning by acting as the digital backbone that

integrates core hotel operations such as reservations, front-desk activities, housekeeping coordination, revenue management, and customer data management. In operational terms, advanced AI-enabled PMS automates routine processes, reduces manual errors, and enhances cross-departmental coordination, enabling hotels to operate more consistently and efficiently. Within the hospitality industry, these capabilities support real-time inventory visibility, dynamic pricing adjustments, and personalized guest services, which are critical for managing fluctuating demand and maximizing room utilization. From a management perspective, AI-based PMS enables hotels to shift from reactive problem-solving to proactive operational planning, improving responsiveness to market changes and guest expectations. In the U.S. hospitality context, where labor shortages and cost pressures are pronounced, such systems help firms sustain service quality while controlling operational complexity and resource use.

Studying AI-based Property Management System functional capability is essential because it represents the core digital infrastructure through which hotels manage increasingly complex and data-intensive operations. Inadequate PMS capability can lead to fragmented operational systems, limited real-time visibility, and inefficient coordination across departments, resulting in higher operating costs and inconsistent service delivery (Bouchareb, 2023; Milton, 2024). In the U.S. hospitality industry, where hotels face labor shortages, demand volatility, and rising operating expenses, weak AI-based PMS functionality can undermine revenue management, inventory optimization, and personalized guest services, thereby reducing competitive advantage (Ivanov & Webster, 2022; Tan et al., 2025). From a policy and industry perspective, failure to strengthen PMS capability may slow sector-wide digital transformation and productivity growth, limiting the hospitality industry's contribution to economic output and employment (Milton, 2024). Examining this variable is therefore critical for informing technology investment strategies and digital modernization initiatives in hotel management.

2.3. AI-Enabled Decision-Support Quality

AI-enabled decision-support quality describes the degree to which AI-driven PMS provides accurate, timely, and actionable insights that enhance managerial decision-making in hotel operations. Recent studies conceptualize decision-support quality as the effectiveness of AI systems in forecasting demand, optimizing pricing, identifying operational risks, and supporting strategic planning through advanced analytics and intelligent recommendations (Milton, 2024; Tan et al., 2025). High-quality AI-enabled decision support is characterized by reliability, interpretability, and relevance of information, enabling managers to make faster and more informed decisions in complex and uncertain hospitality environments (Bouchareb, 2023).

Initially defined as the availability of computerized reports and structured information to assist managerial planning, decision support systems in hospitality were primarily descriptive, retrospective, and limited to financial and occupancy reporting (Turban et al., 2007). As information systems matured, decision-support quality expanded to include real-time dashboards and forecasting tools, shifting the emphasis from historical reporting to short-term planning and control (Kaul, 2018). In its current form, AI-enabled decision-support quality has evolved into a multidimensional construct emphasizing predictive accuracy, interpretability, speed, and contextual relevance, enabled by artificial intelligence and advanced analytics embedded within PMS platforms (Milton, 2024; Tan et al., 2025). This shift reflects a broader transition in hospitality management from intuition-based and experience-driven decisions toward data-driven and algorithmically supported strategic decision-making, particularly in dynamic environments such as revenue management and demand forecasting.

AI-enabled decision-support quality contributes to organizational functioning by enhancing managerial cognition and strategic alignment through timely, accurate, and data-driven insights. Operationally, high-quality AI decision support improves forecasting, pricing decisions, staffing plans, and risk management by transforming large volumes of operational data into actionable recommendations. In hotel management, this capability allows managers to make faster and more informed decisions regarding room rates, demand fluctuations, and resource allocation, reducing reliance on intuition alone. Applied management literature emphasizes that in service-intensive industries like hospitality, decision-support quality directly influences coordination efficiency and strategic consistency across properties. In the U.S. hotel industry, where competition is intense and demand volatility is high, AI-enabled decision support strengthens operational resilience by enabling managers to anticipate changes rather than merely respond to them.

The need to study AI-enabled decision-support quality arises from its direct influence on managerial effectiveness and strategic alignment in hotel operations. Poor-quality decision-support systems can provide inaccurate, delayed, or opaque information, leading to suboptimal pricing, staffing,

and capacity decisions that negatively affect revenue performance and operational stability (Mariani & Wirtz, 2023; Milton, 2024). In highly competitive hospitality markets such as the United States, weak decision-support quality may limit managers' ability to respond proactively to demand fluctuations and cost pressures, reducing the return on AI investments (Tan et al., 2025). From a broader policy and performance perspective, inadequate decision-support systems hinder the adoption of data-driven management practices and constrain organizational learning and innovation (Bouchareb, 2023). Studying this variable helps identify how AI-based decision-support can enhance managerial judgment, strategic consistency, and long-term operational resilience.

2.4. Operational Efficiency

Operational efficiency refers to the extent to which a hotel optimally utilizes its resources, processes, and time to deliver services with minimal waste, cost, and error. Contemporary hospitality research defines operational efficiency as the ability to streamline workflows, automate routine tasks, reduce processing time, and improve coordination across departments through digital technologies such as AI-based PMS (Bouchareb, 2023; Milton, 2024). Recent studies emphasize that operational efficiency is not merely an outcome of technology adoption but a critical mechanism through which AI-driven systems translate technological inputs into improved service quality, cost control, and overall performance (Tan et al., 2025).

Initially defined as cost minimization and labor productivity achieved through standardization and procedural control, operational efficiency in hospitality was traditionally associated with economies of scale and strict process compliance (Slack et al., 2004). As service competition intensified, the concept evolved to incorporate process integration, speed, and flexibility, recognizing that efficiency must coexist with service quality in guest-centric industries (Heskett et al., 1994). More recently, operational efficiency has been reconceptualized as a technology-enabled capability that emphasizes automation, real-time coordination, error reduction, and intelligent resource optimization, particularly through AI-based systems such as advanced PMS platforms (Bouchareb, 2023; Milton, 2024). This evolution reflects a shift from viewing efficiency as a static cost outcome to understanding it as a dynamic operational mechanism that mediates the relationship between digital technologies and performance outcomes in hospitality settings (Tan et al., 2025).

Operational efficiency supports organizational functioning by ensuring that hotel resources, processes, and time are utilized optimally to deliver consistent service outcomes with minimal waste and cost. In operational terms, efficiency gains derived from AI-based systems include streamlined workflows, faster service delivery, reduced duplication of tasks, and improved interdepartmental communication. In the hospitality industry, operational efficiency directly affects guest satisfaction, cost control, and profitability, as inefficient processes often result in service delays and higher labor expenses. Applied management research highlights that technology-driven efficiency is especially valuable in hotels due to their high labor intensity and continuous service cycles. In the context of this study, operational efficiency represents the mechanism through which AI-based PMS capabilities translate into tangible performance outcomes, particularly in U.S. hotels facing rising wages and operational overheads.

Operational efficiency warrants focused study because it directly affects a hotel's ability to deliver consistent service quality while controlling costs in a labor-intensive service environment. Failure to address operational efficiency can result in process bottlenecks, service delays, resource wastage, and escalating labor expenses, which collectively erode profitability and guest satisfaction (Ivanov & Webster, 2022; Malik et al., 2023). In the context of AI-based PMS adoption, neglecting operational efficiency risks treating technology investments as isolated solutions rather than as enablers of process optimization and performance improvement (Bouchareb, 2023). From a policy and sectoral perspective, inefficient hotel operations reduce overall productivity and competitiveness in the hospitality industry, which has broader implications for employment and economic development in the United States (Tan et al., 2025). Studying operational efficiency is therefore necessary to ensure that AI adoption translates into tangible and sustainable performance outcomes.

2.5. Employee AI Readiness

Employee AI readiness refers to the extent to which hotel employees possess the skills, knowledge, attitudes, and willingness required to effectively adopt and work with AI-enabled systems. Recent literature defines AI readiness as a multidimensional construct encompassing technical competence, openness to technological change, trust in AI outputs, and organizational support for learning and adaptation (Ruel & Njoku, 2021; Tan et al., 2025). In the hospitality context, employee AI readiness is increasingly recognized as a critical factor that determines whether AI-based PMS capabilities are fully utilized or underexploited, particularly in

service-intensive environments where human–technology interaction is central to operational success (Milton, 2024).\

Initially, employee readiness for technology was narrowly defined as basic computer literacy and compliance with system usage requirements, with limited attention to attitudes or behavioral adaptation (Venkatesh et al., 2003). As digital transformation progressed, the concept expanded to include technology acceptance, perceived usefulness, and ease of use, emphasizing user engagement rather than mere system adoption (Venkatesh et al., 2012). In recent hospitality and organizational research, employee AI readiness has evolved into a broader construct encompassing digital skills, trust in AI outputs, openness to change, and organizational support for continuous learning in AI-enabled environments (Ruel & Njoku, 2021; Tan et al., 2025). This shift reflects growing recognition of contextual and sectoral differences in service industries, where human–AI interaction is central, and where employee readiness moderates the effectiveness of intelligent systems rather than simply enabling their use.

Employee AI readiness contributes to organizational functioning by determining how effectively intelligent systems are adopted, utilized, and embedded into daily operational routines. Operationally, employees who possess adequate digital skills, positive attitudes toward AI, and trust in system outputs are more likely to use AI-based PMS features effectively, leading to smoother workflows and better service delivery. In the hospitality industry, where human–technology interaction is integral to service quality, employee readiness ensures that AI systems complement rather than disrupt guest experiences. Applied management literature emphasizes that employee readiness reduces resistance to change, accelerates technology adoption, and enhances productivity gains from digital investments. Within the U.S. hotel industry, where workforce turnover is high and skill gaps persist, employee AI readiness becomes a critical condition that amplifies or constrains the operational benefits of AI-based PMS.

Employee AI readiness must be examined because workforce capability and acceptance fundamentally determine whether AI-based systems are effectively utilized in service-oriented industries. Ignoring employee readiness can lead to resistance to AI adoption, skill mismatches, misuse of systems, and heightened concerns about job displacement, ultimately resulting in underutilized technology and limited operational benefits (Ruel & Njoku, 2021; Mariani & Wirtz, 2023). In the U.S. hospitality industry, where service quality relies heavily on employee–guest interaction and workforce turnover is high, low AI readiness can negatively affect both operational efficiency and customer experience (Milton, 2024; Tan et al., 2025). From a policy and organizational standpoint, insufficient attention to employee readiness may exacerbate digital skill gaps and inequality, undermining workforce development and inclusive digital transformation goals. Studying this variable informs training, change management, and human resource policies that support effective AI integration.

2.6. Hotel Operational Performance

Hotel operational performance refers to the overall effectiveness with which a hotel achieves its operational and service-related objectives, encompassing both financial and non-financial outcomes. Recent studies define operational performance in hospitality as a multidimensional construct that includes service quality, guest satisfaction, revenue indicators such as occupancy rate and RevPAR, cost efficiency, and process reliability (Bouchareb, 2023; Milton, 2024). Contemporary research emphasizes that hotel operational performance increasingly depends on the effective integration of intelligent technologies, operational processes, and human capabilities, positioning AI-based PMS as a central driver of sustained performance improvement in competitive hospitality markets (Tan et al., 2025).

Initially defined through narrow financial indicators such as occupancy rate, average daily rate, and cost ratios, hotel operational performance was traditionally evaluated using accounting-based and efficiency-focused metrics (Phillips, 1999). Over time, the concept expanded to include non-financial indicators such as service quality, guest satisfaction, and process reliability, reflecting the service-dominant logic of hospitality operations (Heskett et al., 1994). In recent literature, hotel operational performance has evolved into a multidimensional construct that integrates financial outcomes, service excellence, operational resilience, and technology-enabled productivity, particularly in digitally intensive and post-pandemic hospitality environments (Bouchareb, 2023; Milton, 2024; Tan et al., 2025). This evolution demonstrates a shift from static performance measurement toward a dynamic, systems-based understanding of performance that accounts for the interplay between technology, operations, and human capabilities.

Hotel operational performance reflects the overall effectiveness with which organizational objectives related to service quality, efficiency, and financial outcomes are achieved. From an operational standpoint, performance improvements manifest through higher service consistency, improved guest

satisfaction, better revenue metrics, and stronger cost control. In the hospitality industry, operational performance is closely linked to how well technology, processes, and human resources are aligned to support continuous service delivery. Applied management studies indicate that technology-enabled performance gains are sustainable only when supported by efficient operations and capable employees. In the context of the U.S. hospitality industry, where hotels must balance service excellence with economic pressures, operational performance serves as a comprehensive outcome that captures the combined impact of AI-based PMS functional capability, decision-support quality, operational efficiency, and employee readiness.

Hotel operational performance is a critical variable because it represents the ultimate outcome through which the effectiveness of AI-based PMS, decision-support quality, operational efficiency, and employee readiness can be evaluated. Without systematic examination of operational performance, hotels lack clear evidence on whether AI-driven digital transformation initiatives improve service quality, financial outcomes, and operational resilience (Bouchareb, 2023; Milton, 2024). In the U.S. hospitality industry, weak operational performance can reduce competitiveness, customer loyalty, and resilience to economic shocks, affecting both firm-level sustainability and sector-wide economic contributions (Ivanov & Webster, 2022; Tan et al., 2025). From a policy perspective, understanding operational performance outcomes is essential for assessing the broader impact of technology adoption on productivity, employment, and service-sector growth. Studying this variable provides a comprehensive basis for evaluating strategic decisions and guiding future investments in intelligent hotel operations.

Table 2: Critical Review of Recent Studies on AI-Based Property Management Systems and Hotel Performance (2022–2025)

Variable	Key Empirical Evidence and Findings	Contradictions and Limitations	References (Author, Year)
AI-Based PMS Functional Capability	Recent studies generally find that AI-based PMS functionalities such as predictive pricing, real-time inventory management, and automated front-office operations improve operational coordination and revenue outcomes, particularly in technologically advanced hotel chains.	Benefits are uneven across hotel size and context; smaller hotels experience weaker gains due to cost and integration constraints. PMS capabilities are often studied as isolated modules rather than as an integrated system.	Bouchareb (2023); Ivanov & Webster (2022); Malik et al. (2023); Milton (2024); Tan et al. (2025)
AI-Enabled Decision-Support Quality	Most studies report that AI-driven decision-support enhances forecasting accuracy, pricing decisions, and managerial responsiveness, supporting more data-driven hotel management.	Some studies indicate weak effects when AI outputs lack transparency or when managers have low trust in algorithmic recommendations. Measurement approaches vary widely.	Milton (2024); Malik et al. (2023); Mariani & Wirtz (2023); Tan et al. (2025); Bouchareb (2023)
Operational Efficiency	There is strong agreement that AI-based systems improve operational efficiency through automation, error reduction, and optimized resource utilization.	Efficiency gains are conditional on system integration and workflow alignment; few studies empirically test efficiency as a mediating variable.	Bouchareb (2023); Ivanov & Webster (2022); Malik et al. (2023); Mariani & Wirtz (2023); Tan et al. (2025)
Employee AI Readiness	Studies increasingly emphasize that employee skills, attitudes, and trust in AI significantly influence the effectiveness of AI-based systems in hospitality.	Findings are inconsistent due to resistance to change, fear of job displacement, and limited training; readiness is rarely modeled as a moderator.	Ruel & Njoku (2021); Malik et al. (2023); Mariani & Wirtz (2023); Tan et al. (2025); Milton (2024)
Hotel Operational Performance	Most studies find that AI adoption contributes positively to both financial and non-financial performance outcomes, including service quality and guest satisfaction.	Performance improvements are uneven and may be offset by high implementation costs and short-term operational disruption; performance measures are often narrow.	Bouchareb (2023); Ivanov & Webster (2022); Malik et al. (2023); Milton (2024); Tan et al. (2025)

2.7. Hypotheses Development

The rapid integration of artificial intelligence (AI) into hotel Property Management Systems (PMS) has transformed these systems from transactional tools into strategic digital infrastructures that shape operational outcomes. Drawing on the Resource-Based View and Dynamic Capabilities Theory, AI-based PMS functional capability can be viewed as a firm-specific technological resource that enables hotels to automate processes, integrate real-time data, and enhance service coordination. Recent hospitality research suggests that hotels leveraging advanced AI-based PMS capabilities demonstrate improved responsiveness, consistency, and overall operational effectiveness, particularly in dynamic and competitive environments (Bouchareb, 2023; Ivanov & Webster, 2022; Tan et al., 2025). Accordingly, it is

proposed that AI-based PMS functional capability has a direct and positive influence on hotel operational performance.

H1: AI-based Property Management System functional capability has a significant positive effect on hotel operational performance.

In addition to system functionality, the quality of AI-enabled decision support plays a crucial role in shaping managerial effectiveness and performance outcomes. Decision Theory and Information Processing Theory posit that organizations perform better when managers are supported by accurate, timely, and relevant information. AI-enabled decision-support systems embedded within PMS platforms enhance forecasting accuracy, pricing decisions, and resource allocation by transforming complex data into actionable insights. Empirical evidence from recent hospitality studies indicates that high-quality AI-driven decision support strengthens strategic alignment and operational outcomes in hotels facing demand uncertainty and cost pressures (Mariani & Wirtz, 2023; Milton, 2024; Tan et al., 2025). Therefore, a positive direct relationship between AI-enabled decision-support quality and hotel operational performance is expected.

H2: AI-enabled decision-support quality has a significant positive effect on hotel operational performance.

While AI-based PMS capabilities and decision-support quality are expected to influence performance, their effects are unlikely to be immediate and direct alone. The Service-Profit Chain and Process Management theories suggest that technological resources translate into performance outcomes primarily through improvements in internal operational processes. AI-based PMS enhances automation, workflow integration, and error reduction, which improve operational efficiency before influencing service quality and performance metrics (Ivanov & Webster, 2022; Bouchareb, 2023). Recent studies emphasize that without efficiency gains, the performance benefits of AI adoption remain limited. Thus, operational efficiency is posited as a mediating mechanism linking AI-based PMS capability to hotel operational performance.

H3: Operational efficiency mediates the relationship between AI-based Property Management System functional capability and hotel operational performance.

Similarly, the impact of AI-enabled decision-support quality on performance is expected to operate through operational efficiency. Information Processing Theory suggests that improved decision quality enhances performance by enabling more efficient operational actions rather than producing immediate outcomes. High-quality AI-driven insights support better scheduling, staffing, and capacity utilization, which improve operational efficiency and subsequently enhance performance (Mariani & Wirtz, 2023; Milton, 2024). Consistent with the Service-Profit Chain framework, operational efficiency is therefore expected to mediate the relationship between AI-enabled decision-support quality and hotel operational performance.

H4: Operational efficiency mediates the relationship between AI-enabled decision-support quality and hotel operational performance.

Despite the potential of AI-based systems, their effectiveness is contingent upon human and organizational factors. Socio-Technical Systems Theory and Human Capital Theory emphasize that performance outcomes depend on the alignment between technological systems and employee capabilities. Employee AI readiness, reflected in digital skills, trust in AI outputs, and openness to technological change, determines the extent to which AI-based PMS functionalities are effectively utilized (Ruel & Njoku, 2021; Mariani & Wirtz, 2023). Recent hospitality research suggests that AI-based systems yield stronger performance outcomes when employees are adequately prepared to work with intelligent technologies (Milton, 2024; Tan et al., 2025). Accordingly, employee AI readiness is expected to moderate the relationship between AI-based PMS functional capability and hotel operational performance.

H5: Employee AI readiness moderates the relationship between AI-based Property Management System functional capability and hotel operational performance, such that the relationship is stronger when employee AI readiness is high.

Finally, the relationship between operational efficiency and hotel operational performance is also likely to be contingent on employee AI readiness. Although efficient processes are critical for performance, their successful execution in service-oriented environments depends on employees' ability to sustain and adapt to technology-enabled workflows. Socio-Technical Systems Theory suggests that efficiency gains translate into performance only when employees possess the skills and readiness to maintain process integrity and service quality (Ruel & Njoku, 2021; Mariani & Wirtz, 2023). Recent evidence from the hospitality sector indicates that higher employee AI readiness strengthens the positive impact of operational efficiency on performance outcomes (Milton, 2024; Tan et al., 2025).

H6: Employee AI readiness moderates the relationship between operational efficiency and hotel operational performance, such that the relationship is stronger when employee AI readiness is high.

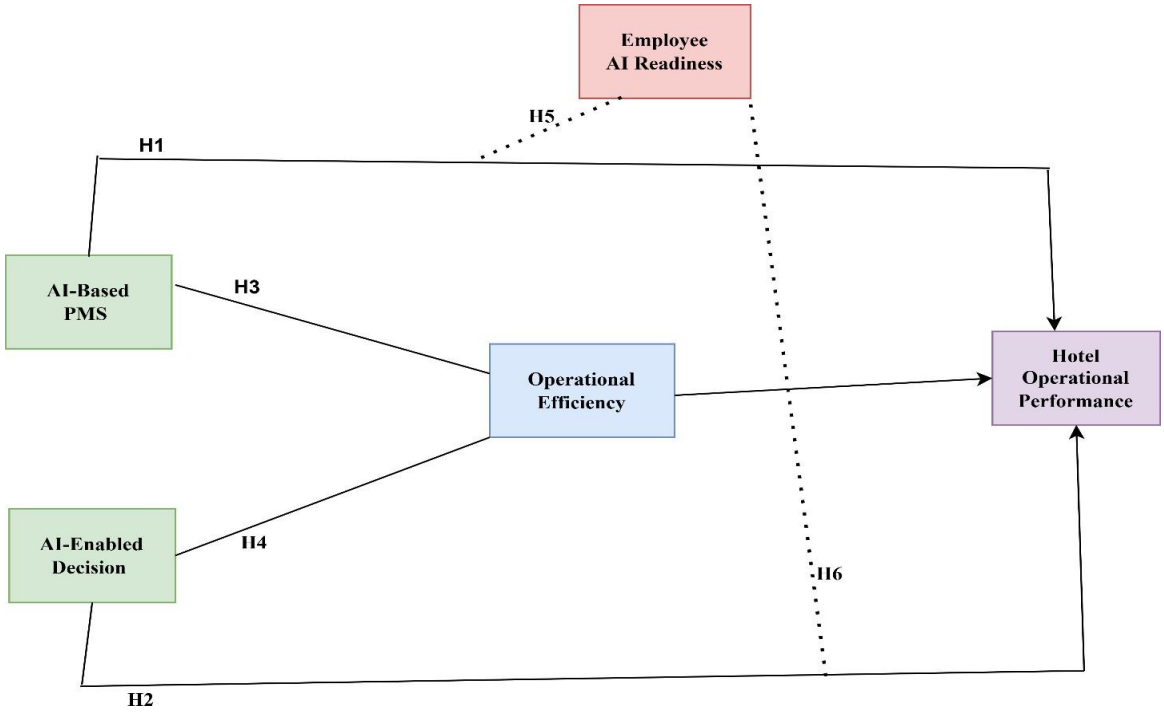

Figure 1: Proposed Research Model

3. RESEARCH METHODOLOGY:

3.1. Research Design:

The research adopts a quantitative, explanatory research design to examine the relationships among AI-based Property Management System functional capability, AI-enabled decision-support quality, operational efficiency, employee AI readiness, and hotel operational performance within the U.S. hospitality industry. A cross-sectional survey approach is employed to collect primary data from managerial and supervisory-level employees working in hotels that have implemented AI-based PMS solutions. This design is appropriate for testing direct, mediating, and moderating relationships simultaneously and for validating the proposed conceptual framework grounded in established theories. Data are analyzed using multivariate statistical techniques, with structural equation modeling employed to assess the measurement and structural models, evaluate mediation effects, and test moderation interactions. The chosen research design allows for systematic hypothesis testing, enhances the generalizability of findings within the hospitality context, and provides empirical evidence on how technological, operational, and human factors jointly influence hotel operational performance.

3.2. Measurement of Variables

The measurement instruments for this study are adapted from validated scales in recent hospitality and information systems literature and measured using multi-item constructs on a five-point Likert scale ranging from strongly disagree to strongly agree. AI-based Property Management System functional capability is measured using items capturing the extent of AI integration in reservations, dynamic pricing, real-time inventory management, analytics, and system automation, adapted from recent AI–PMS and digital transformation studies in hospitality (Bouchareb, 2023; Milton, 2024). AI-enabled decision-support quality is measured through items assessing accuracy, timeliness, relevance, and interpretability of AI-generated insights used for managerial decision-making, drawing on decision-support and AI analytics literature (Mariani & Wirtz, 2023; Tan et al., 2025). Operational efficiency is measured using indicators related to workflow integration, process speed, cost control, error reduction, and resource utilization, consistent with recent hospitality operations and technology-enabled efficiency studies (Ivanov & Webster, 2022; Bouchareb, 2023). Employee AI readiness is measured through items reflecting employees' digital skills, openness to AI adoption, trust in AI outputs, and organizational support for AI-related learning, adapted from AI readiness and socio-technical systems research (Ruel & Njoku, 2021; Tan et al., 2025). Hotel operational performance is measured as a multidimensional construct using both financial and non-financial indicators, including service quality, guest satisfaction, operational reliability, occupancy performance, and cost efficiency, based on recent hospitality performance

measurement literature (Milton, 2024; Tan et al., 2025). Together, these instruments ensure content validity and alignment with the study's conceptual framework and hypotheses.

3.3. Population and Sampling

The population of this study comprises managerial- and supervisory-level employees working in hotels across the United States that have implemented or are in the process of implementing AI-based Property Management Systems. This population is appropriate because managers and supervisors are directly involved in operational decision-making, system usage, and performance evaluation, making them well positioned to assess AI-based PMS functional capability, decision-support quality, operational efficiency, employee AI readiness, and hotel operational performance. A sample size of 450 respondents is targeted, which is considered adequate and statistically robust for multivariate analysis and structural equation modeling, particularly for models involving mediation and moderation effects (Hair et al., 2022; Kline, 2023). A non-probability purposive sampling technique is employed to ensure that respondents possess relevant knowledge and experience with AI-based PMS, consistent with recent hospitality and information systems research where access to specialized managerial populations is required (Ivanov & Webster, 2022; Tan et al., 2025). The selected sample size exceeds the minimum thresholds recommended for SEM-based studies, enhances statistical power, and improves the generalizability of findings within the U.S. hospitality context, where hotels vary significantly in size, ownership structure, and level of technological maturity.

3.4. Data Collection Method:

Data for this study are collected using a structured questionnaire administered through an online survey method, which is considered appropriate for reaching geographically dispersed respondents within the U.S. hospitality industry. The questionnaire is distributed electronically to managerial- and supervisory-level employees working in hotels that utilize AI-based Property Management Systems, using professional networks, industry associations, and direct hotel contacts to ensure access to relevant respondents. Online data collection facilitates efficient administration, anonymity, and higher response accuracy, particularly for technology- and performance-related constructs (Hair et al., 2022; Saunders et al., 2023). Prior to full deployment, the survey instrument is pre-tested through a pilot study to assess clarity, reliability, and content validity, and necessary refinements are made based on feedback. The data collection process follows ethical research guidelines, including informed consent and confidentiality assurance, and is conducted over a defined time period to minimize response bias and ensure consistency in measurement across respondents.

3.5. Respondents Demographic Profile:

The final sample for this study consists of 450 valid respondents drawn from managerial- and supervisory-level employees working in U.S. hotels that have adopted AI-based Property Management Systems. In terms of gender distribution, the sample includes approximately 58% male ($n \approx 261$) and 42% female respondents ($n \approx 189$), reflecting the managerial workforce composition of the U.S. hospitality industry. Respondents' ages range from 25 to 60 years, with the majority falling between 31 and 45 years, indicating a predominance of mid-career professionals actively involved in operational and strategic decision-making. Regarding job designation, the sample includes general managers (approximately 12%), assistant or deputy general managers (10%), operations managers (18%), front office managers (16%), revenue and yield managers (12%), housekeeping and food-and-beverage managers (14%), IT or systems managers (8%), and departmental supervisors (10%), ensuring representation across core hotel functions. In terms of work experience, around 28% of respondents have less than 5 years of experience, 41% have between 6 and 15 years, and 31% possess more than 15 years of experience in the hospitality industry, providing insights from both emerging and highly experienced professionals. Respondents are employed across a broad range of hotel organizations, including international chains and brands such as Marriott, Hilton, Hyatt, InterContinental Hotels Group (IHG), Wyndham, Choice Hotels, and Accor, as well as independent and boutique hotels. Geographically, participants are distributed across major U.S. states including California, New York, Texas, Florida, Illinois, Nevada, Massachusetts, Georgia, and Washington, covering the West, Northeast, Midwest, and Southern regions. The sample further represents diverse hotel categories, including budget, mid-scale, upscale, and luxury properties, and includes small hotels with fewer than 100 rooms, medium-sized hotels with 100–300 rooms, and large hotels and resorts with more than 300 rooms. This detailed and balanced demographic composition enhances the robustness, representativeness, and generalizability of the study's findings across the U.S. hospitality industry.

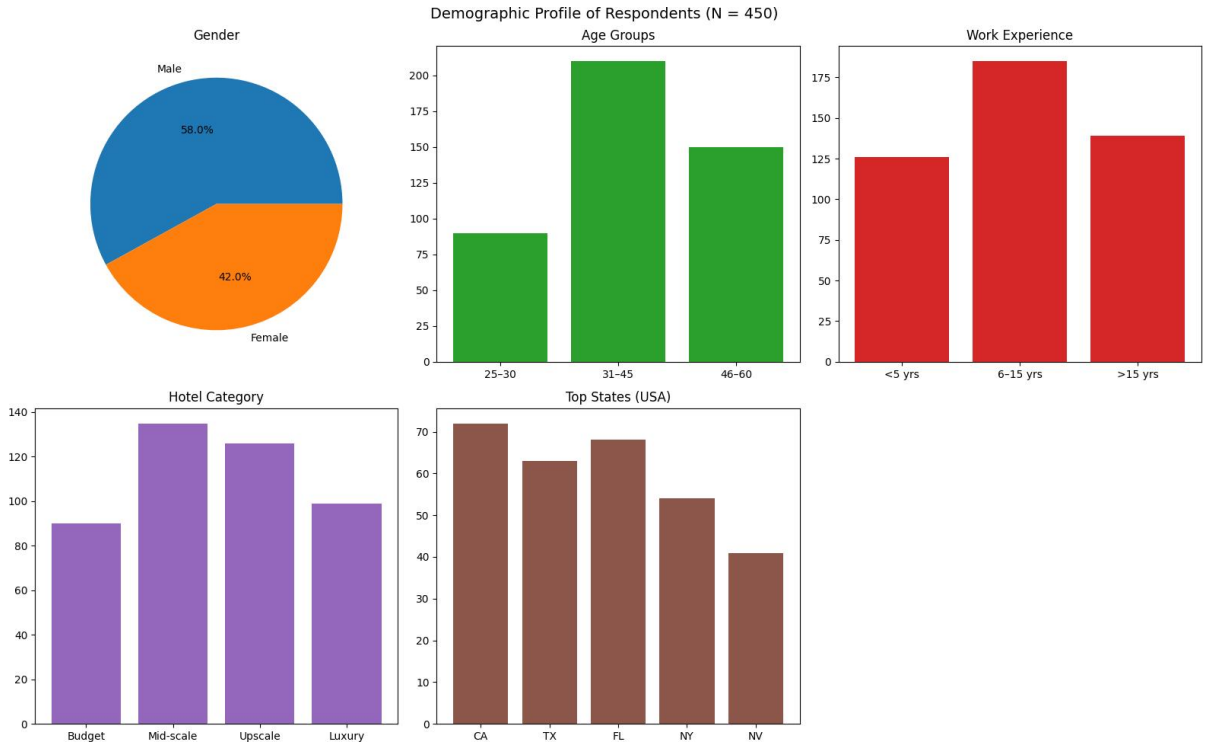

Figure 2: Respondents Profile

3.6. Data Analysis Technique

Data analysis in this study is conducted using Structural Equation Modeling (SEM) with Smart PLS 4, which is appropriate for testing complex research models involving multiple constructs, mediating effects, and moderating relationships. The partial least squares SEM (PLS-SEM) approach is selected due to its suitability for prediction-oriented research, its ability to handle non-normal data distributions, and its robustness with relatively large and complex models. The analysis follows a two-step procedure, beginning with the assessment of the measurement model to evaluate indicator reliability, internal consistency reliability, convergent validity, and discriminant validity using criteria such as factor loadings, Cronbach's alpha, composite reliability, average variance extracted (AVE), and the Fornell–Larcker and HTMT ratios. Subsequently, the structural model is assessed to test the hypothesized relationships using path coefficients, coefficient of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2). Mediation effects are examined through bootstrapping procedures to assess indirect effects, while moderation effects are tested using interaction terms within Smart PLS 4. A bootstrapping procedure with a large number of resamples is employed to determine the significance of path coefficients and hypothesis testing. Overall, the use of Smart PLS 4 enables a comprehensive and rigorous examination of the proposed conceptual framework and provides robust empirical evidence regarding the relationships among AI-based PMS capabilities, operational efficiency, employee AI readiness, and hotel operational performance.

3.7. Assessment of Measurement Model

The assessment of the measurement model in this study is conducted using SmartPLS 4 to ensure the reliability and validity of all latent constructs before evaluating the structural relationships. Indicator reliability is first examined by assessing outer loadings, with values exceeding the recommended threshold of 0.70 indicating adequate item reliability. Internal consistency reliability is then evaluated using Cronbach's alpha and composite reliability, with values above 0.70 confirming the consistency of the measurement scales. Convergent validity is assessed through the average variance extracted (AVE), where values greater than 0.50 demonstrate that the constructs explain a sufficient proportion of variance in their indicators. Discriminant validity is examined using both the Fornell–Larcker criterion and the heterotrait–monotrait (HTMT) ratio, ensuring that each construct is empirically distinct from the others. The Fornell–Larcker criterion requires that the square root of each construct's AVE exceeds its correlations with other constructs, while HTMT values below the recommended threshold indicate adequate discriminant validity. Overall, the

measurement model assessment confirms that the constructs used in the study exhibit satisfactory reliability and validity, thereby providing a sound basis for subsequent structural model analysis using PLS-SEM.

Table 3 demonstrates that the measurement model exhibits satisfactory internal consistency, reliability, and convergent validity across all constructs, in line with established PLS-SEM guidelines. All indicator factor loadings exceed the recommended threshold of 0.70, indicating strong item reliability, while variance inflation factor (VIF) values remain below the conservative cutoff of 5, suggesting no multicollinearity concerns among indicators (Hair et al., 2022; Kline, 2023). Cronbach's alpha and composite reliability values for all constructs surpass the minimum acceptable level of 0.70, confirming adequate internal consistency and construct reliability, with particularly strong reliability observed for Hotel Operational Performance, Employee AI Readiness, and Operational Efficiency. Furthermore, the average variance extracted (AVE) values for all constructs exceed the recommended threshold of 0.50, indicating that each construct explains more than half of the variance in its indicators and thus satisfies convergent validity requirements. Collectively, these results confirm that the measurement scales used in the study are both reliable and valid, providing a robust foundation for subsequent structural model analysis using SmartPLS 4 (Hair et al., 2022; Sarstedt et al., 2022).

Table 4 presents the assessment of discriminant validity using the heterotrait–monotrait (HTMT) ratio and indicates that discriminant validity is satisfactorily established for all constructs in the measurement model. All HTMT values are well below the conservative threshold of 0.85, and also below the more liberal cutoff of 0.90, suggesting that each construct is empirically distinct from the others and measures a unique conceptual domain (Henseler et al., 2015; Hair et al., 2022). Specifically, the HTMT values between AI-enabled decision-support quality and AI-based PMS (0.694), employee AI readiness (0.569), hotel operational performance (0.555), and operational efficiency (0.587) remain within acceptable limits, indicating adequate construct separation. Similarly, the HTMT values among AI-based PMS, employee AI readiness, hotel operational performance, and operational efficiency range from 0.437 to 0.551, further confirming the absence of discriminant validity concerns. These results demonstrate that the constructs are not excessively correlated and that multicollinearity at the construct level is unlikely, thereby providing strong evidence that the measurement model meets discriminant validity requirements and is suitable for subsequent structural model analysis using PLS-SEM (Henseler et al., 2015; Sarstedt et al., 2022).

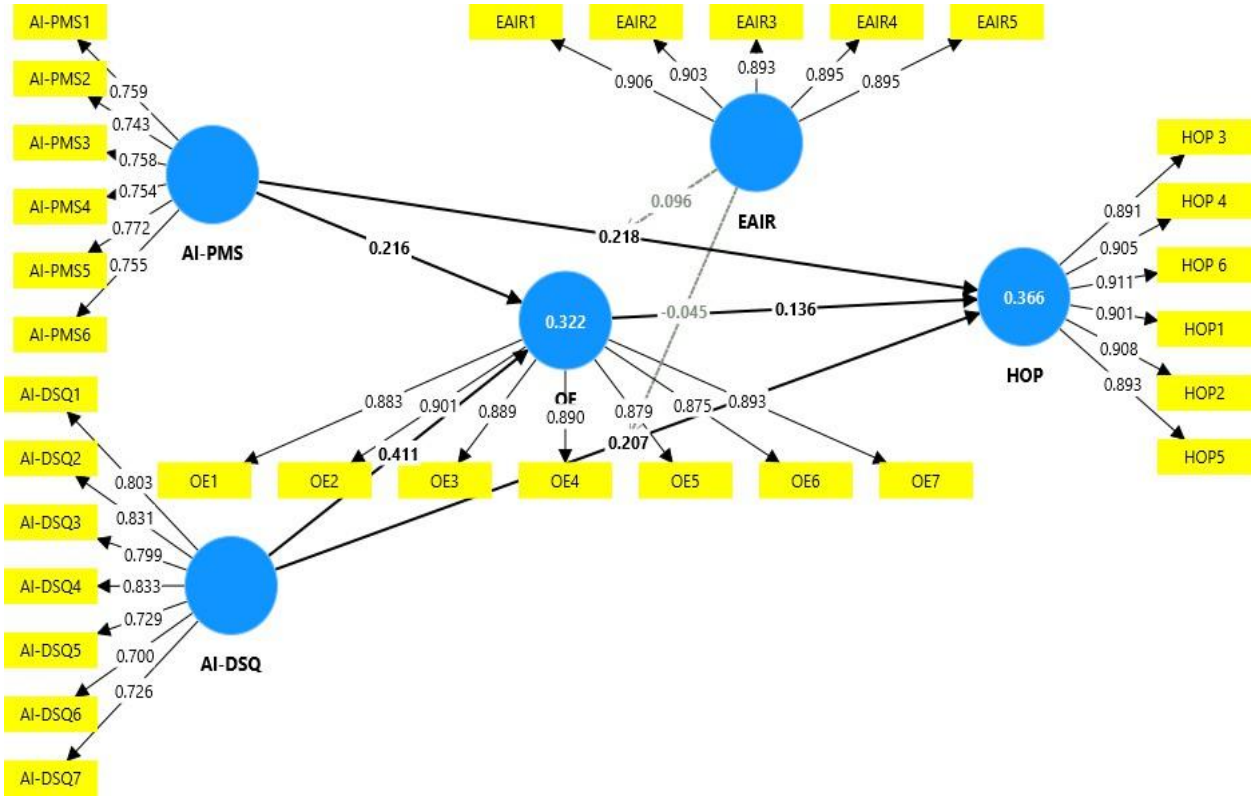

Figure 3: Estimated Analysis of Proposed Model *Source: Created by the Authors*

Table 3: Internal Consistency, Reliability and Convergent Validity

Construct/Items	Factor Loadings	VIF values	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
AI- Property Management System			0.851	0.889	0.573
AI-PMS1	0.759	3.240			
AI-PMS 2	0.743	2.789			
AI-PMS 3	0.758	3.182			
AI-PMS 4	0.754	2.966			
AI-PMS 5	0.772	3.027			
AI-PMS 6	0.755	3.008			
AI-Enabled Decision-Support Quality			0.889	0.913	0.602
AI-DSQ1	0.803	3.614			
AI-DSQ2	0.831	3.373			
AI-DSQ3	0.799	3.243			
AI-DSQ4	0.833	3.592			
AI-DSQ5	0.729	2.846			
AI-DSQ6	0.700	2.823			
AI-DSQ7	0.726	3.033			
Hotel Operational Performance			0.954	0.963	0.813
HOP 3	0.891	3.499			
HOP 4	0.905	3.805			
HOP 6	0.911	4.247			
HOP1	0.901	3.705			
HOP2	0.908	4.008			
HOP5	0.893	3.520			
Employee AI Readiness			0.940	0.954	0.807
EAIR1	0.906	3.426			
EAIR2	0.903	3.493			
EAIR3	0.893	3.361			
EAIR4	0.895	3.314			
EAIR5	0.895	3.299			
Operational Efficiency			0.955	0.963	0.787
OE1	0.883	3.427			
OE2	0.901	3.962			
OE3	0.889	3.632			
OE4	0.890	3.632			
OE5	0.879	3.348			
OE6	0.875	3.326			
OE7	0.893	3.572			

Table 4: Discriminate Validity Heterotrait-Monotrait (HTMT) Ratio

	AI-DSQ	AI-PMS	EAIR	HOP	OE
AI-DSQ					
AI-PMS	0.694				
EAIR	0.569	0.533			
HOP	0.555	0.551	0.479		
OE	0.587	0.513	0.437	0.452	

3.8. Hypotheses Testing:

Table 5 summarizes the results of the bootstrapping analysis for the direct relationship hypotheses and provides strong empirical support for both proposed paths. The results indicate that AI-based Property Management System functional capability has a significant positive effect on hotel operational performance ($\beta = 0.218$, $t = 4.272$, $p < 0.001$), with the confidence interval not straddling zero, thereby confirming H1. This finding suggests that enhanced AI-driven PMS functionalities contribute directly to improved operational outcomes in hotels. Similarly, AI-enabled decision-support quality also shows a significant positive relationship with hotel operational performance ($\beta = 0.207$, $t = 4.215$, $p < 0.001$), supporting H2, with a narrow confidence interval further reinforcing the robustness of the effect. The statistically significant t-values

exceeding the recommended threshold and the p-values well below 0.05 indicate strong explanatory power of both predictors in the structural model (Hair et al., 2022; Sarstedt et al., 2022). Overall, these results demonstrate that both AI-based PMS capability and AI-enabled decision-support quality play important and independent roles in enhancing hotel operational performance, providing empirical validation for the theoretical assumptions underpinning the study and justifying further examination of indirect and conditional effects in the model.

Table 5: Summary of Direct Relationship Hypotheses Results (Bootstrapping Report)

Hypothesis	β Value	t-value	P - Value	C I (LL, UL)	Results
H1:AI-PMS→HOP	0.218	4.272	0.000	(0.120, 0.316)	Accepted
H2:AI-DSQ→HOP	0.207	4.215	0.000	(0.113, 0.304)	Accepted

Table 6 presents the mediation analysis results and demonstrates that operational efficiency plays a statistically significant mediating role in the relationships between AI-based systems and hotel operational performance. The indirect effect of AI-based Property Management System functional capability on hotel operational performance through operational efficiency is positive and significant (β = 0.029, t = 2.341, p = 0.019), with the confidence interval not including zero, confirming the presence of mediation and supporting H3. However, the variance accounted for (VAF = 11.74%) indicates weak mediation, suggesting that while operational efficiency explains part of the relationship, AI-PMS also exerts a substantial direct effect on performance. Similarly, the indirect effect of AI-enabled decision-support quality on hotel operational performance through operational efficiency is significant (β = 0.056, t = 2.602, p = 0.009), supporting H4, with a higher VAF value of 24.03%, indicating partial mediation. This finding implies that AI-enabled decision-support quality influences hotel operational performance both directly and indirectly by enhancing operational efficiency. The coexistence of significant direct and indirect effects in both relationships aligns with PLS-SEM mediation guidelines and suggests complementary mediation, where operational efficiency acts as an important but not exclusive mechanism linking AI capabilities to performance outcomes (Hair et al., 2022; Zhao et al., 2010; Sarstedt et al., 2022).

Table 6: Mediation Type and Effect

Hypothesis	Indirect Effect (β)	t-value	P -Value	CI(LL, UL)	Direct Effect (β)	Total Effect (β)	VAF (%)	Mediation Result
H3:AI-PMS → OE→ HOP	0.029	2.341	0.019	(0.008, 0.057)	0.218	0.247	11.74	Weak Mediation
H4:AI-DSQ →OE → HOP	0.056	2.602	0.009	(0.016, 0.100)	0.207	0.233	24.03	Partial Mediation

Table 7 reports the moderation analysis results based on the bootstrapping procedure and provides mixed support for the proposed moderating effects of employee AI readiness. The interaction effect between employee AI readiness and AI-based Property Management System functional capability on hotel operational performance is positive and statistically significant (β = 0.096, t = 2.027, p = 0.043), with the confidence interval marginally excluding zero, thereby supporting H5. This result indicates that employee AI readiness strengthens the positive relationship between AI-based PMS capability and hotel operational performance, suggesting that hotels with higher levels of employee readiness are better able to leverage advanced PMS functionalities to enhance operational outcomes. In contrast, the interaction effect between employee AI readiness and AI-enabled decision-support quality on hotel operational performance is not statistically significant (β = −0.045, t = 0.999, p = 0.318), and the confidence interval includes zero, leading to the rejection of H6. This finding implies that employee AI readiness does not significantly condition the effect of AI-enabled decision-support quality on performance, possibly because decision-support outputs are more manager-centric and less dependent on broader employee engagement. Overall, these results partially support the socio-technical systems perspective, highlighting that employee readiness plays a contingent role in amplifying the performance benefits of system-level AI capabilities, but not necessarily in the use of AI-driven decision-support tools (Hair et al., 2022; Mariani & Wirtz, 2023; Sarstedt et al., 2022).

Table 7: Summary of Moderation Relationship Hypotheses Results (Bootstrapping Report)

Hypothesis	β Value	t-value	P - Value	C I (LL, UL)	Results
H5:EAIRxAI-PMS → HOP	0.096	2.027	0.043	(-0.001, 0.186)	Accepted
H6:EAIRxAI-DSQ → HOP	-0.045	0.999	0.318	(-0.133, 0.043)	Rejected

3.9. Predive relevance, R Square and effect size

Table 7 presents the assessment of predictive relevance (Q^2), explained variance (R^2), and effect sizes (f^2), providing insight into the model's explanatory and predictive power. The R-square values indicate that the model explains 36.6% of the variance in hotel operational performance (HOP) and 32.2% of the variance in operational efficiency (OE), which can be considered moderate explanatory power in behavioral and hospitality research contexts (Hair et al., 2022; Sarstedt et al., 2022). The Q-square values for HOP (0.293) and OE (0.251) are both greater than zero, demonstrating that the model has strong predictive relevance for these endogenous constructs. Regarding effect sizes, AI-enabled decision-support quality (f^2 = 0.159) and AI-based PMS functional capability (f^2 = 0.044) exhibit small to moderate effects on hotel operational performance, indicating meaningful but differential contributions to performance outcomes. Similarly, AI-DSQ (f^2 = 0.034), AI-PMS (f^2 = 0.044), and employee AI readiness (f^2 = 0.039) show small effect sizes on operational efficiency, suggesting that each predictor contributes incrementally to efficiency improvements. Overall, these results confirm that the proposed model not only explains a substantial portion of variance in key outcome variables but also demonstrates adequate predictive relevance, reinforcing the robustness and practical utility of the PLS-SEM model (Hair et al., 2022; Shmueli et al., 2019).

Table 8: Predive Relevance, R Square and effect size

	AI-DSQ	AI-PMS	EAIR	HOP	OE
AI-DSQ				**0.034**	**0.159**
AI-PMS				**0.044**	**0.044**
EAIR				**0.039**	
HOP					
OE				**0.019**	
R-square				**0.366**	**0.322**
Q-square				**0.293**	**0.251**

4. DISCUSSION

The findings of this study provide robust empirical evidence on how artificial intelligence (AI)–based Property Management Systems influence hotel operational performance in the U.S. hospitality industry through direct, mediating, and moderating mechanisms. Consistent with the proposed hypotheses, the results demonstrate that both AI-based PMS functional capability and AI-enabled decision-support quality have significant positive direct effects on hotel operational performance. These findings align strongly with recent hospitality and service management research, which emphasizes that advanced AI-driven systems enhance operational coordination, service consistency, and data-driven responsiveness, thereby improving performance outcomes (Bouchareb, 2023; Ivanov & Webster, 2022; Milton, 2024). From a theoretical perspective, these results support the Resource-Based View and Dynamic Capabilities Theory, suggesting that AI-based PMS constitutes a valuable and strategically important organizational resource that enables hotels to adapt effectively to dynamic market conditions.

The significant positive relationship between AI-enabled decision-support quality and hotel operational performance further reinforces the growing consensus that AI-driven analytics and intelligent recommendations enhance managerial decision-making in complex service environments. This finding is consistent with studies by Mariani and Wirtz (2023) and Tan et al. (2025), who argue that high-quality AI decision-support systems improve forecasting accuracy, pricing effectiveness, and resource allocation in hospitality settings. However, the effect size observed in this study suggests that while decision-support quality contributes meaningfully to performance, its impact is somewhat comparable to that of system-level AI capabilities, highlighting that both technological infrastructure and analytical intelligence are critical for operational success.

The mediation analysis reveals that operational efficiency plays a significant, albeit differentiated, mediating role in the relationships between AI capabilities and performance. Specifically, operational efficiency weakly mediates the relationship between AI-based PMS functional capability and hotel operational performance, while partially mediating the relationship between AI-enabled decision-support quality and performance. These findings are consistent with prior studies suggesting that AI technologies influence performance both directly and indirectly through process improvements (Ivanov & Webster, 2022; Bouchareb, 2023). The weak mediation observed for AI-based PMS may be explained by the fact that PMS functionalities such as system integration and automation can directly enhance performance outcomes, such as service reliability and

responsiveness, without necessarily operating entirely through efficiency gains. In contrast, the stronger partial mediation for AI-enabled decision-support quality supports Information Processing Theory, indicating that improved decision quality enhances performance primarily by enabling more efficient operational actions, such as optimized staffing and capacity utilization (Milton, 2024; Tan et al., 2025).

The moderation analysis offers nuanced insights into the role of employee AI readiness. The findings indicate that employee AI readiness significantly strengthens the relationship between AI-based PMS functional capability and hotel operational performance, supporting socio-technical systems theory, which emphasizes the alignment between technological systems and human capabilities (Ruel & Njoku, 2021). This result is consistent with recent hospitality research highlighting that advanced AI systems deliver superior outcomes only when employees possess the skills, trust, and openness required to use them effectively (Mariani & Wirtz, 2023; Milton, 2024). However, employee AI readiness does not significantly moderate the relationship between AI-enabled decision-support quality and performance, which contrasts with some expectations in the literature. This non-significant moderation may be explained by the managerial nature of decision-support systems, which are often used by a limited group of decision-makers rather than the broader workforce. As such, the influence of general employee readiness may be less critical in translating AI-driven decision insights into performance outcomes, a finding that aligns with studies suggesting that decision-support tools are more centralized and less dependent on organization-wide adoption (Tan et al., 2025).

The predictive relevance and explanatory power of the model further strengthen the discussion of these findings. The moderate R^2 values for hotel operational performance and operational efficiency indicate that the proposed model explains a substantial portion of variance in key outcomes, which is consistent with benchmarks in hospitality and management research (Hair et al., 2022; Sarstedt et al., 2022). The positive Q^2 values confirm that the model possesses strong predictive relevance, reinforcing the practical utility of integrating AI capabilities, operational mechanisms, and human readiness in explaining hotel performance.

Overall, the findings contribute to the growing body of hospitality and information systems literature by offering an integrated empirical explanation of AI-based PMS value creation. While supporting much of the existing literature on the positive role of AI in hotel operations, the study also challenges overly deterministic views of AI adoption by demonstrating that performance gains depend on both operational efficiency mechanisms and employee readiness conditions. These results underscore the importance of adopting a holistic, socio-technical perspective when implementing AI-based PMS in the U.S. hospitality industry and provide a nuanced understanding of why AI investments succeed in some contexts but yield limited returns in others.

4.1. Theoretical Implications

This study makes several important theoretical contributions to the hospitality management and information systems literature by advancing understanding of how artificial intelligence–based Property Management Systems create operational value. First, the findings extend the Resource-Based View and Dynamic Capabilities Theory by empirically demonstrating that AI-based PMS functional capability and AI-enabled decision-support quality function as strategic organizational resources that directly enhance hotel operational performance. Unlike prior studies that examined AI adoption in a fragmented or exploratory manner, this study provides an integrated model that links AI capabilities to performance outcomes through operational efficiency and contingent human factors, thereby enriching theory-driven explanations of AI value creation in hospitality contexts (Bouchareb, 2023; Ivanov & Webster, 2022; Tan et al., 2025). Second, the study contributes to the Service-Profit Chain and Information Processing Theory by empirically validating operational efficiency as a mediating mechanism through which AI-based systems translate technological inputs into performance outcomes. The differentiated mediation effects observed in the study refine existing theory by showing that AI-based PMS and AI-enabled decision-support influence performance through both direct and indirect pathways, rather than through efficiency alone (Milton, 2024; Sarstedt et al., 2022). Third, by incorporating employee AI readiness as a moderating variable, the study advances Socio-Technical Systems Theory, highlighting that the performance impact of AI technologies depends on the alignment between technical systems and human capabilities. The mixed moderation findings further nuance this theory by demonstrating that employee readiness strengthens system-level AI impacts but does not uniformly condition decision-support outcomes, thereby offering a more context-sensitive understanding of human–AI interaction in service organizations (Mariani & Wirtz, 2023; Ruel & Njoku, 2021).

4.2. Practical Implications

From a practical perspective, the findings offer actionable insights for hotel owners, managers, and policymakers seeking to maximize the benefits of AI-based PMS investments. First, the significant direct effects of AI-based PMS functional capability and AI-enabled decision-support quality on hotel operational performance suggest that hotel managers should view AI-based PMS not merely as an IT upgrade, but as a strategic operational asset that supports service quality, revenue optimization, and operational resilience. Investment decisions should therefore prioritize systems with advanced AI functionalities, real-time analytics, and integration capabilities rather than basic transactional features (Bouchareb, 2023; Milton, 2024). Second, the mediating role of operational efficiency underscores the importance of aligning AI adoption with process redesign and workflow optimization. Hotels that implement AI-based PMS without addressing underlying operational inefficiencies may fail to realize the full performance benefits of these technologies. Managers should therefore focus on reengineering processes, standardizing workflows, and leveraging AI insights to improve coordination across departments (Ivanov & Webster, 2022; Tan et al., 2025). Third, the significant moderating role of employee AI readiness in strengthening the AI-PMS–performance relationship highlights the critical need for workforce development initiatives. Hotel managers should invest in training programs, change management strategies, and communication efforts that enhance employees' digital skills, trust in AI systems, and openness to technological change. From a policy perspective, industry associations and hospitality regulators can use these insights to support workforce upskilling and digital transformation initiatives, ensuring that AI adoption contributes to productivity growth and service-sector competitiveness in the U.S. hospitality industry (Mariani & Wirtz, 2023; Ruel & Njoku, 2021; Tan et al., 2025).

5. CONCLUSION

This study set out to examine how artificial intelligence–based Property Management Systems transform hotel operations and performance within the U.S. hospitality industry by integrating technological, operational, and human perspectives. Synthesizing the discussion and empirical findings, the results confirm that both AI-based PMS functional capability and AI-enabled decision-support quality play significant and complementary roles in enhancing hotel operational performance. The findings demonstrate that AI-driven systems contribute not only through direct performance improvements—such as better coordination, responsiveness, and decision accuracy—but also indirectly by strengthening operational efficiency, which serves as an important mechanism translating technological capabilities into tangible outcomes. At the same time, the study highlights that technology alone is insufficient; employee AI readiness emerges as a critical contextual factor that amplifies the performance benefits of AI-based PMS, underscoring the importance of socio-technical alignment in service-oriented organizations. The mixed moderation results further refine this understanding by showing that human readiness is more influential for system-level AI utilization than for manager-centric decision-support tools. Overall, the study provides an integrated and nuanced explanation of AI value creation in hotel operations, demonstrating that sustainable performance gains arise from the combined alignment of advanced AI technologies, efficient operational processes, and a workforce prepared to engage with intelligent systems. By bridging gaps in prior fragmented research, this study advances theory and offers practical insight into how AI-based PMS can be strategically leveraged to support operational excellence and competitiveness in the evolving U.S. hospitality industry.

5.1. Limitations and Future Research Directions

Despite its theoretical and practical contributions, this study has several limitations that should be acknowledged, which also offer opportunities for future research. First, the study adopts a cross-sectional research design, which restricts the ability to draw strong causal inferences about the relationships among AI-based PMS functional capability, decision-support quality, operational efficiency, employee AI readiness, and hotel operational performance. Future studies could employ longitudinal or panel data designs to examine how the impacts of AI-based PMS evolve over time and to capture learning effects and post-implementation performance dynamics (Hair et al., 2022; Tan et al., 2025). Second, the data are collected using self-reported measures from managerial and supervisory respondents, which may introduce common method bias and subjective evaluation of performance outcomes. Future research could incorporate objective performance indicators, such as financial records, occupancy data, or system-generated operational metrics, to strengthen the robustness of findings (Podsakoff et al., 2012; Milton, 2024).

Third, while the study focuses on hotels operating

within the United States, the findings may have limited generalizability to other national or cultural contexts where regulatory environments, labor markets, and levels of digital maturity differ. Comparative or cross-country studies could extend this research by examining AI-based PMS adoption and performance outcomes in emerging markets or other service industries, such as restaurants or tourism platforms, to enhance external validity (Ivanov & Webster, 2022; Mariani & Wirtz, 2023). Fourth, although employee AI readiness is included as a moderating variable, the study does not explicitly differentiate between managerial readiness and frontline employee readiness. Future research could disaggregate these dimensions to explore how different employee groups interact with AI-based systems and how this affects operational and service outcomes (Ruel & Njoku, 2021; Tan et al., 2025).

Finally, future studies could expand the theoretical scope of the model by incorporating additional organizational and environmental variables, such as organizational culture, leadership support, data governance practices, and ethical considerations related to AI use. Examining nonlinear relationships, alternative mediators (e.g., service innovation or customer experience), and boundary conditions using mixed-methods or experimental designs would further deepen understanding of AI-driven transformation in hospitality operations. Such extensions would contribute to a more comprehensive and dynamic view of how AI-based PMS can be strategically leveraged to achieve sustainable competitive advantage in the hospitality industry.