The 3rd ASEAN School of Business Network International Conference 2026
www.aseansbn.org August 6-7, 2026 Pathum Thani, Thailand

Artificial Intelligence Applications Across Procurement Modules: A Systematic Literature Review

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ABSTRACT

Artificial intelligence (AI) has become an important driver of procurement transformation, improving decision-making, operational efficiency, supplier management, and organizational resilience. Despite the rapid growth of AI research in procurement, the existing literature remains fragmented because previous studies have primarily examined AI from technological, digital transformation, or source-to-pay perspectives only. This fragmentation limits a comprehensive understanding of how AI applications differ across individual procurement modules. Therefore, this study aims to systematically synthesize the existing literature on AI applications across procurement modules by identifying AI implementation patterns, dominant AI technologies, organizational benefits, implementation challenges, and future research opportunities.

This study employed a systematic literature review (SLR) following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Relevant studies published between 2020 and 2026 were systematically identified, screened, and analyzed using procurement modules as the primary analytical perspective. The synthesis focuses on AI applications across spend analysis, strategic sourcing, supplier selection, contract management, purchase requisition, purchase order management, invoice processing, supplier relationship management, and supplier risk management.

The findings reveal that AI adoption is unevenly distributed across procurement modules. Strategic procurement activities, particularly supplier selection, strategic sourcing, contract management, and supplier risk management, have received substantially greater research attention than operational procurement activities. Machine learning remains the dominant technology for predictive analytics and decision optimization, while natural language processing and large language models are primarily employed for document-intensive procurement activities. Furthermore, generative AI is emerging as a transformative capability that extends AI applications beyond process automation towards procurement planning, supplier collaboration, knowledge management, and strategic decision support. The review also identifies recurring implementation challenges related to data quality, organizational readiness, AI governance, explainability, and human-AI collaboration.

Keywords: Artificial intelligence, Procurement modules, Systematic literature review, Purchasing and supply management, Procurement Management

DOI: https://doi.org/10.64458/asbnic.v3.145

INTRODUCTION

The increasing complexity of global business environments has fundamentally transformed the role of procurement from a traditional purchasing function into a strategic organizational capability that directly influences competitiveness, operational resilience, and long-term value creation. Cui et al. (2022) argued that procurement has evolved beyond routine transactional activities and increasingly contributes to organizational performance through data-driven decision-making and strategic supplier management. Supporting this perspective, Frederico et al. (2021) demonstrated that effective procurement and strategic sourcing strengthen supply chain resilience, particularly during periods of disruption and market uncertainty. Similarly, Althabatah et al. (2023) emphasized that the emergence of Procurement 4.0 has accelerated the digital transformation of procurement by integrating advanced digital technologies into procurement processes. As organizations continue to face volatile markets, supply chain disruptions, and growing sustainability expectations, procurement is no longer expected to merely reduce costs but also to improve agility, support innovation, and strengthen organizational adaptability.

Artificial intelligence has rapidly expanded across procurement activities, supporting organizations in improving both operational efficiency and strategic decision-making throughout the procurement lifecycle. Guida et al. (2023) observed that AI applications are no longer confined to isolated procurement functions but increasingly span multiple procurement modules, including spend analysis, strategic sourcing, supplier selection, contract management, purchase requisition, purchase order management, invoice processing, supplier relationship management, and supplier risk management. Building upon this observation, Lakhal et al. (2025) explained that AI technologies are progressively integrated throughout the source-to-pay process to enhance procurement intelligence, automate routine activities, and improve organizational responsiveness. Spreitzenbarth et al. (2024) similarly concluded that purchasing and supply management has experienced substantial growth in AI adoption, driven by continuous advances in machine learning, predictive analytics, and intelligent automation.

The reviewed literature also demonstrates that AI technologies perform different functions depending on the objectives of individual procurement activities. Abdulla and Baryannis, (2024) showed that explainable machine learning improves supplier evaluation by increasing decision transparency while maintaining predictive accuracy. Reitsma et al. (2025) demonstrated that AI-assisted analytics strengthen strategic sourcing decisions by supporting supplier assessment and sourcing optimization under uncertain market conditions. In operational procurement, Arslan et al. (2024) and Baviskar et al. (2021) reported that intelligent document processing significantly improves invoice processing accuracy and reduces administrative workloads. More recently, van Hoek, (2024) highlighted that Generative AI and large language models are beginning to support procurement planning, supplier communication, and knowledge-intensive procurement activities. Collectively, these developments demonstrate that AI adoption has progressed beyond isolated automation initiatives towards broader organizational transformation, affecting multiple procurement modules with distinct objectives, decision requirements, and technological characteristics.

Existing review studies have substantially advanced the understanding of artificial intelligence in procurement by examining the topic from different theoretical and practical perspectives. Guida et al. (2023) provided one of the earliest comprehensive reviews by synthesizing the state of the art of AI throughout procurement activities and identifying key research directions for future investigation. Expanding this work, Spreitzenbarth et al. (2024) combined academic publications with industry evidence to examine the maturity of artificial intelligence and machine learning within purchasing and supply management, highlighting both technological opportunities and implementation challenges. Rather than focusing on the broader procurement process, van Hoek (2024) examined AI adoption from an industry perspective and emphasized how organizations increasingly employ AI to strengthen procurement decision-making while identifying practical barriers associated with organizational readiness and implementation. More recently, Lakhal et al. (2025) reviewed AI adoption across the

source-to-pay process by discussing both theoretical developments and practical applications, demonstrating the expanding role of AI throughout procurement activities.

Although these review studies collectively demonstrate the growing importance of AI within procurement, they also reveal considerable diversity in their analytical perspectives and classification approaches. Some studies primarily categorize AI according to technological developments, whereas others emphasize digital transformation, Procurement 4.0, purchasing functions, or the source-to-pay process (Guida et al., 2023; Lakhal et al., 2025; Spreitzenbarth et al., 2024). At the same time, recent empirical studies have continued to investigate AI applications within specific procurement activities such as supplier evaluation, strategic sourcing, contract management, procurement analytics, invoice automation, and procurement risk management (Abdulla & Baryannis, 2024; Dikmen et al., 2025; Modgil et al., 2025; Reitsma et al., 2025) Collectively, these studies have significantly enriched the procurement literature by demonstrating the diverse capabilities of AI technologies and their growing contribution to procurement performance. However, they also indicate that AI research has evolved across multiple directions, making it increasingly difficult to obtain an integrated understanding of how AI applications differ across individual procurement modules.

Despite the significant progress achieved by previous review studies, an important gap remains in the current body of knowledge. Existing reviews have primarily synthesized AI adoption according to technological developments, Procurement 4.0, purchasing and supply management, or the source-to-pay process, providing valuable insights into the evolution of intelligent procurement systems(Guida et al., 2023; Lakhal et al., 2025; Spreitzenbarth et al., 2024). However, these perspectives do not fully capture the functional diversity of procurement activities. Procurement is composed of multiple modules that differ substantially in their objectives, decision complexity, data characteristics, operational requirements, and managerial responsibilities. Consequently, AI applications cannot be assumed to generate similar benefits, implementation challenges, or organizational outcomes across all procurement modules.

The increasing diversity of AI technologies further reinforces the need for a module-based perspective. Recent studies demonstrate that machine learning, natural language processing, large language models, and Generative AI are applied to different procurement activities according to their analytical capabilities and decision requirements (Abdulla & Baryannis, 2024; Dikmen et al., 2025; Modgil et al., 2025; van Hoek, 2024) Nevertheless, the existing literature provides limited comparative evidence regarding how these technologies are distributed across procurement modules, which technologies dominate particular procurement activities, and how their reported organizational benefits and implementation challenges differ throughout the procurement lifecycle. As AI adoption continues to expand, this fragmentation makes it increasingly difficult for both researchers and practitioners to obtain an integrated understanding of AI-enabled procurement.

To address this gap, the present study adopts the procurement modules proposed by Guida et al. (2023) as the organizing structure for synthesizing the existing literature on artificial intelligence in procurement. Rather than reviewing AI from a technology-oriented or process-oriented perspective, this study systematically examines how AI applications are distributed across procurement modules, compares the AI technologies implemented within each module, synthesizes the reported organizational benefits and implementation challenges, and identifies research gaps that can guide future investigations. By adopting this perspective, the review provides a more comprehensive understanding of AI-enabled procurement while offering a structured foundation for both academic research and managerial practice.

The limitations identified in previous review studies highlight the need for a more structured synthesis of artificial intelligence applications across procurement modules. Addressing this need, the present study conducts a systematic literature review to consolidate and critically evaluate the existing body of knowledge on AI adoption throughout procurement activities. By adopting procurement modules as the primary unit of analysis, this review seeks to provide a comprehensive understanding of

how AI technologies are implemented across different procurement functions, how these technologies contribute to organizational performance, and where important research opportunities remain. This approach enables a more systematic comparison of AI applications while offering practical insights for organizations seeking to develop intelligent and integrated procurement systems.

To achieve these objectives, this study addresses the following research questions:

RQ1: *How has artificial intelligence been applied across different procurement modules?*

RQ2: *What AI technologies are most commonly adopted within procurement modules, and what organizational benefits and implementation challenges have been reported?*

RQ3: *What research gaps and future research opportunities emerge from the existing literature on AI applications across procurement modules?*

Collectively, these research questions provide a structured framework for synthesizing the existing literature while ensuring that the review extends beyond identifying AI applications. They also facilitate a systematic examination of technological adoption, organizational implications, and future research directions, thereby providing a comprehensive perspective on the evolving role of AI within procurement.

This review extends the existing procurement literature by providing a structured synthesis of artificial intelligence applications through the perspective of procurement modules. Whereas previous review studies have examined AI adoption from viewpoints such as intelligent purchasing, digital procurement, purchasing and supply management, or the source-to-pay process, Guida et al. (2023) demonstrated the importance of organizing procurement activities into distinct procurement modules to better understand AI implementation across the procurement lifecycle. Building upon this perspective, the present review integrates evidence from recent empirical and review studies to examine how AI technologies are distributed across procurement modules, how technological adoption differs according to procurement objectives, and how organizational benefits and implementation challenges vary across procurement activities. Spreitzenbarth et al. (2024) highlighted the increasing maturity of AI and machine learning within purchasing and supply management, while Lakhal et al. (2025) emphasized the growing integration of AI throughout the source-to-pay process. Rather than replicating these perspectives, this review complements the existing literature by providing a cross-module comparison that links technological development with functional procurement characteristics. By consolidating fragmented evidence into a unified analytical structure, the review offers a stronger theoretical foundation for future AI-enabled procurement research while providing practical insights that may support organizations in designing more effective AI implementation strategies.

The proposed module-based perspective also provides a practical analytical structure for interpreting the rapidly expanding body of AI procurement research. As AI technologies continue to evolve from conventional machine learning models towards large language models and Generative AI, procurement research is expected to become increasingly interdisciplinary, integrating perspectives from operations management, information systems, supply chain management, and organizational decision-making. Consequently, synthesizing the literature through procurement modules not only facilitates a systematic comparison of technological applications but also improves the understanding of how AI capabilities create value across interconnected procurement activities. This perspective is expected to support both researchers seeking to advance procurement theory and practitioners responsible for designing intelligent procurement systems capable of responding to dynamic organizational and supply chain challenges.

LITERATURE REVIEW

Artificial intelligence (AI) has become one of the principal drivers of digital transformation in procurement management, fundamentally changing how organizations acquire, evaluate, and manage suppliers while supporting increasingly complex procurement decisions. As procurement evolves from an administrative purchasing function into a strategic organizational capability, researchers have

devoted growing attention to understanding how AI enhances procurement performance through intelligent automation, predictive analytics, and data-driven decision-making. This growing interest has produced a rapidly expanding body of literature examining AI across various procurement activities, indicating that digital technologies are reshaping both operational and strategic dimensions of procurement management.

Although previous studies consistently recognize the transformative role of AI in procurement, they approach the phenomenon from different analytical perspectives. Guida et al. (2023) synthesized the literature by mapping AI applications across procurement activities and identified substantial growth in research addressing sourcing, supplier evaluation, procurement analytics, and purchasing automation. In contrast, van Hoek (2024) examined the emergence of Generative Artificial Intelligence and argued that recent technological developments extend procurement capabilities beyond operational automation towards knowledge-intensive managerial activities. A broader organizational perspective was offered by van Hoek (2024), who emphasized AI as an integrated technological capability supporting organizational intelligence across multiple business functions. While these studies collectively demonstrate the growing strategic importance of AI, they also reveal considerable variation in how AI adoption is conceptualized and analysed.

The diversity of existing studies has significantly enriched current knowledge but has also resulted in fragmented evidence regarding AI implementation within procurement. Some studies investigate specific AI technologies, whereas others concentrate on particular procurement activities such as strategic sourcing, supplier evaluation, contract management, or supplier relationship management. Consequently, existing evidence provides valuable insights into individual aspects of AI-enabled procurement but offers limited understanding of how AI applications are distributed across interconnected procurement modules. This fragmentation restricts both theoretical understanding and practical decision-making because organizations require an integrated perspective of AI adoption throughout procurement rather than isolated evidence from individual procurement activities.

To address this limitation, the present literature review establishes the conceptual foundation of the study by critically examining four interrelated themes. It first discusses artificial intelligence as the technological capability underpinning intelligent procurement. It then examines procurement management as an evolving strategic organizational function before introducing procurement modules as the analytical perspective adopted in this study, drawing upon the procurement activities synthesized by Guida et al. (2023). Finally, previous studies on AI-enabled procurement are critically synthesized to identify prevailing research trends, conceptual limitations, and research opportunities that provide the foundation for this systematic literature review

Artificial Intelligence

Artificial intelligence (AI) has become a fundamental driver of digital transformation, enabling organizations to improve operational efficiency, decision quality, and strategic responsiveness through intelligent data processing and computational learning. Unlike conventional information systems that primarily automate predefined tasks, AI possesses the capability to learn from historical data, identify complex patterns, generate predictions, and support decision-making under uncertainty. Consequently, AI has evolved from an operational technology into a strategic organizational capability that creates value across multiple business functions, including procurement, supply chain management, finance, and operations.

The strategic importance of AI has been consistently recognized in recent procurement literature, although researchers have approached the technology from different perspectives. Existing evidence indicates that AI adoption extends beyond automating transactional procurement activitietowardsrd supporting intelligent decision-making throughout the procurement lifecycle. For example, Guida et al. (2023) synthesized previous studies and identified substantial growth in AI applications across procurement activities, particularly in spend analysis, supplier evaluation, sourcing, contract

management, and supplier relationship management. Complementing this perspective, Spreitzenbarth et al., (2024) emphasized that machine learning and advanced analytics are increasingly embedded within purchasing processes to improve procurement intelligence and decision quality, while Althabatah et al. (2023) positioned AI as one of the enabling technologies underpinning Procurement 4.0 through its integration with big data analytics, cloud computing, and other digital infrastructures. Collectively, these studies indicate that AI has become an integral component of procurement transformation rather than an isolated technological innovation.

Recent technological developments have further expanded the capabilities of AI within procurement management. While earlier research predominantly examined machine learning, predictive analytics, and robotic process automation, contemporary studies increasingly focus on Generative AI and large language models (LLMs) as technologies capable of supporting knowledge-intensive procurement activities. van Hoek (2024) argued that Generative AI enables procurement professionals to enhance planning, document preparation, supplier communication, and strategic decision-making by augmenting human expertise rather than replacing it. Similarly, recent studies in your reference base, including works on AI-enabled procurement transformation and intelligent decision support, suggest that AI is progressively shifting from process automatiotowardsrd cognitive assistance and organizational learning. This evolution reflects a broader transition in which AI contributes not only to efficiency gains but also to knowledge creation and strategic capability development.

Procurement Management

Procurement management has undergone a substantial transformation over the past decade, evolving from a transactional purchasing function into a strategic organizational capability that directly contributes to organizational performance and competitive advantage. Traditionally, procurement focused primarily on acquiring goods and services at the lowest possible cost while ensuring quality and timely delivery. However, increasing supply chain uncertainty, digital transformation, sustainability requirements, and global market disruptions have significantly expanded the role of procurement beyond operational purchasing. Contemporary organizations increasingly recognize procurement as a value-creating function that supports strategic sourcing, supplier collaboration, innovation, risk mitigation, and long-term organizational resilience.

Recent studies consistently support this strategic perspective, although they emphasize different dimensions of procurement management. Cui et al. (2022) argued that the integration of artificial intelligence has fundamentally changed procurement from a transaction-oriented function into a data-driven decision-making process capable of improving purchasing performance and organizational responsiveness. From a strategic sourcing perspective, Ghosh et al. (2021) demonstrated that procurement contributes to organizational value when sourcing decisions simultaneously consider economic, environmental, and operational objectives rather than focusing exclusively on cost reduction. Similarly, Frederico et al. (2021) highlighted that well-structured strategic sourcing processes strengthen supply chain responsiveness and organizational adaptability during periods of disruption. Collectively, these studies indicate that procurement performance increasingly depends on strategic coordination rather than isolated purchasing decisions.

The strategic role of procurement has become even more prominent with the emergence of digital procurement ecosystems. Rather than managing procurement activities independently, organizations increasingly integrate procurement processes through interconnected digital technologies that enable real-time information sharing, intelligent analytics, and automated decision support. Althabatah et al. (2023) described this transformation as a defining characteristic of Procurement 4.0, in which artificial intelligence, big data analytics, cloud computing, and automation technologies collectively improve procurement visibility, operational efficiency, and decision quality. Complementing this perspective, Charnor and Quartey (2024) reported that digital procurement adoption positively influences

procurement performance by improving process transparency, organizational coordination, and information accessibility. These findings suggest that procurement effectiveness increasingly depends on an organization's ability to integrate digital technologies into its procurement strategy.

Although procurement has become increasingly strategic, existing research continues to examine many procurement activities independently. Strategic sourcing, supplier selection, contract management, purchasing execution, and supplier relationship management are frequently investigated as separate topics despite their strong operational interdependence. Reitsma et al. (2025) emphasized that strategic sourcing decisions influence supplier performance and subsequent procurement outcomes, while recent procurement studies increasingly acknowledge that procurement activities should be viewed as interconnected stages within a broader organizational process. This fragmented treatment limits a comprehensive understanding of how technological innovations create value throughout the procurement lifecycle rather than within isolated procurement functions.

Taken together, the contemporary literature suggests that procurement management should be conceptualized as an integrated strategic system comprising multiple interconnected activities that collectively determine procurement performance. Understanding procurement from this perspective provides an appropriate conceptual foundation for analysing the implementation of artificial intelligence, as AI rarely influences only a single procurement activity. Instead, its organizational value emerges through interactions across multiple procurement activities that collectively form the procurement lifecycle. Consequently, the following section introduces procurement modules as the analytical perspective adopted to organize and synthesize the existing literature on AI-enabled procurement.

Procurement Modules

As procurement management has evolved into an integrated strategic function, researchers have increasingly recognized that procurement activities cannot be adequately understood in isolation. Instead, procurement comprises a sequence of interconnected managerial activities in which decisions made at one stage influence operational efficiency and strategic performance at subsequent stages. This process-oriented perspective has become increasingly relevant in the context of digital transformation, where intelligent technologies generate value by connecting information, processes, and decision-making across the procurement lifecycle rather than optimizing individual activities independently.

Recent procurement literature reflects this integrated view, although procurement activities are categorized differently across studies. Guida et al. (2023) synthesized the existing literature by mapping artificial intelligence applications across procurement activities and demonstrated that intelligent technologies have expanded beyond individual purchasing functions to support a broad range of activities, including spend analysis, strategic sourcing, supplier evaluation, contract management, purchasing execution, and supplier management. A similar perspective can be identified in the broader procurement literature, where Reitsma et al. (2025) emphasized that strategic sourcing decisions influence downstream procurement performance through their effects on supplier capability, contractual arrangements, and purchasing effectiveness. Likewise, Frederico et al. (2021) argued that procurement activities should be managed as an integrated process to improve organizational responsiveness and long-term supply chain performance. Collectively, these studies suggest that procurement activities should be analysed as interconnected components of a unified procurement system rather than as independent operational functions.

Building upon these perspectives, the present study adopts the concept of procurement modules as its analytical framework for organizing and synthesizing previous research. Rather than representing separate organizational departments, procurement modules refer to logically related groups of procurement activities that perform specific managerial functions while remaining operationally interdependent throughout the procurement lifecycle. This approach enables a structured comparison

of previous studies by classifying AI applications according to the procurement activity they primarily support, thereby reducing conceptual overlap and improving the consistency of evidence synthesis.

Accordingly, this systematic literature review organizes the identified studies into nine procurement modules: spend analysis, strategic sourcing, supplier selection, contract management, purchase requisition, purchase order management, invoice processing, supplier relationship management, and supplier risk management. Together, these modules represent the principal activities through which organizations plan procurement strategies, evaluate suppliers, execute purchasing transactions, manage contractual obligations, develop supplier relationships, and mitigate procurement-related risks. Although each module addresses distinct managerial objectives, they remain highly interconnected because information and decisions generated within one module frequently influence subsequent procurement activities.

Artificial Intelligence in Procurement

The application of artificial intelligence has become one of the most prominent themes in contemporary procurement research, reflecting the increasing digitalization of procurement processes and organizational decision-making. While early studies primarily emphasized the automation of routine purchasing activities, recent research demonstrates that AI is increasingly deployed to support analytical, strategic, and collaborative procurement functions. This evolution suggests that AI should no longer be viewed solely as an operational technology but rather as a strategic capability capable of enhancing procurement performance throughout the procurement lifecycle.

The diversity of AI technologies has further contributed to variations in procurement research. Machine learning remains the dominant technology for predictive tasks such as demand forecasting, spend analysis, and supplier evaluation, whereas natural language processing has become increasingly important for contract analysis, document management, and invoice processing. More recently, Generative AI and large language models have introduced new opportunities for knowledge-intensive procurement activities, including strategic planning, supplier communication, and decision support. These developments indicate that the choice of AI technology is closely associated with the objectives, information characteristics, and decision complexity of individual procurement activities rather than representing a universal technological solution.

METHOD

Research Design

This study employs a Systematic Literature Review (SLR) to synthesize and critically evaluate the existing body of knowledge concerning artificial intelligence applications across procurement modules. Compared with conventional narrative reviews, the SLR approach provides a transparent, rigorous, and reproducible procedure for identifying, selecting, evaluating, and synthesizing relevant studies, thereby minimizing selection bias while improving the reliability of research findings. Consequently, SLR has become one of the most widely adopted evidence synthesis methods for consolidating fragmented knowledge and identifying emerging research trends across rapidly evolving scientific domains.

To ensure methodological rigor, this review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines developed by Page et al. (2021). PRISMA provides a standardized framework for conducting systematic reviews through four sequential stages: identification, screening, eligibility assessment, and final study inclusion. Employing this protocol enhances the transparency and reproducibility of the review process while enabling readers to clearly understand how the final body of literature was established.

Data Source and Search Strategy

Unlike previous review studies that predominantly organize procurement literature according to AI technologies or industrial sectors, the present study adopts procurement modules as the primary analytical framework for evidence synthesis. Following the procurement activities synthesized by Guida et al. (2023), the selected studies are systematically classified into nine procurement modules: spend analysis, strategic sourcing, supplier selection, contract management, purchase requisition, purchase order management, invoice processing, supplier relationship management, and supplier risk management. This module-based classification enables a more structured comparison of AI implementation across the procurement lifecycle while facilitating the identification of dominant research themes, technological trends, and underexplored research areas.

Guided by the three research questions presented in the Introduction, the review synthesizes the selected studies by examining (1) how AI has been applied across procurement modules, (2) which AI technologies have been implemented and for what procurement purposes, and (3) the research trends, challenges, and future research opportunities emerging from the existing literature. Through this analytical strategy, the study aims to provide a comprehensive and evidence-based understanding of AI-enabled procurement while establishing a structured foundation for subsequent analysis and discussion.

- ("Artificial Intelligence" OR AI OR "Machine Learning" OR "Generative AI" OR LLM) AND Procurement
- ("Artificial Intelligence") AND ("Supplier Selection")
- ("Machine Learning") AND ("Strategic Sourcing")
- ("Artificial Intelligence") AND ("Contract Management")
- ("Generative AI") AND Procurement

To capture contemporary developments in AI-enabled procurement, the search focused on publications published between 2021 and 2026. This period was selected because it reflects the rapid advancement of AI technologies, including machine learning, natural language processing, and Generative AI, as well as the increasing scholarly interest in Procurement 4.0 and intelligent procurement systems. Restricting the review to recent publications also ensured that the synthesized evidence reflects current technological developments and organizational practices.

The initial search results obtained from both databases were exported and manually reviewed to remove duplicate records. Titles, abstracts, and keywords were subsequently screened to determine their relevance to the research objectives before proceeding to the eligibility assessment stage. The complete study selection process is presented in the PRISMA flow diagram in the following subsection.

Inclusion and Exclusion Criteria

The retrieved studies were screened following the PRISMA 2020 framework. Duplicate records identified across Google Scholar and R Discovery were removed prior to screening. Subsequently, titles, abstracts, and keywords were evaluated to determine their relevance to the research objectives. Studies meeting the initial screening criteria were then subjected to full-text assessment to determine their eligibility for inclusion in the review.

To ensure consistency and transparency, predefined inclusion and exclusion criteria were applied throughout the selection process.

Inclusion criteria

- Published between 2021 and 2026.
- Written in English.
- Published in peer-reviewed journals or conference proceedings.
- Focused on artificial intelligence applications in procurement or purchasing.
- Provided sufficient methodological and empirical information relevant to the research questions.

Exclusion criteria

- Duplicate publications.
- Editorials, book reviews, news articles, and non-academic publications.
- Studies unrelated to procurement or purchasing.
- Studies lacking accessible full text.
- Publications that did not discuss AI implementation within procurement-related activities.

Figure 1 presents the PRISMA 2020 flow diagram summarizing the study identification, screening, eligibility assessment, and inclusion process.

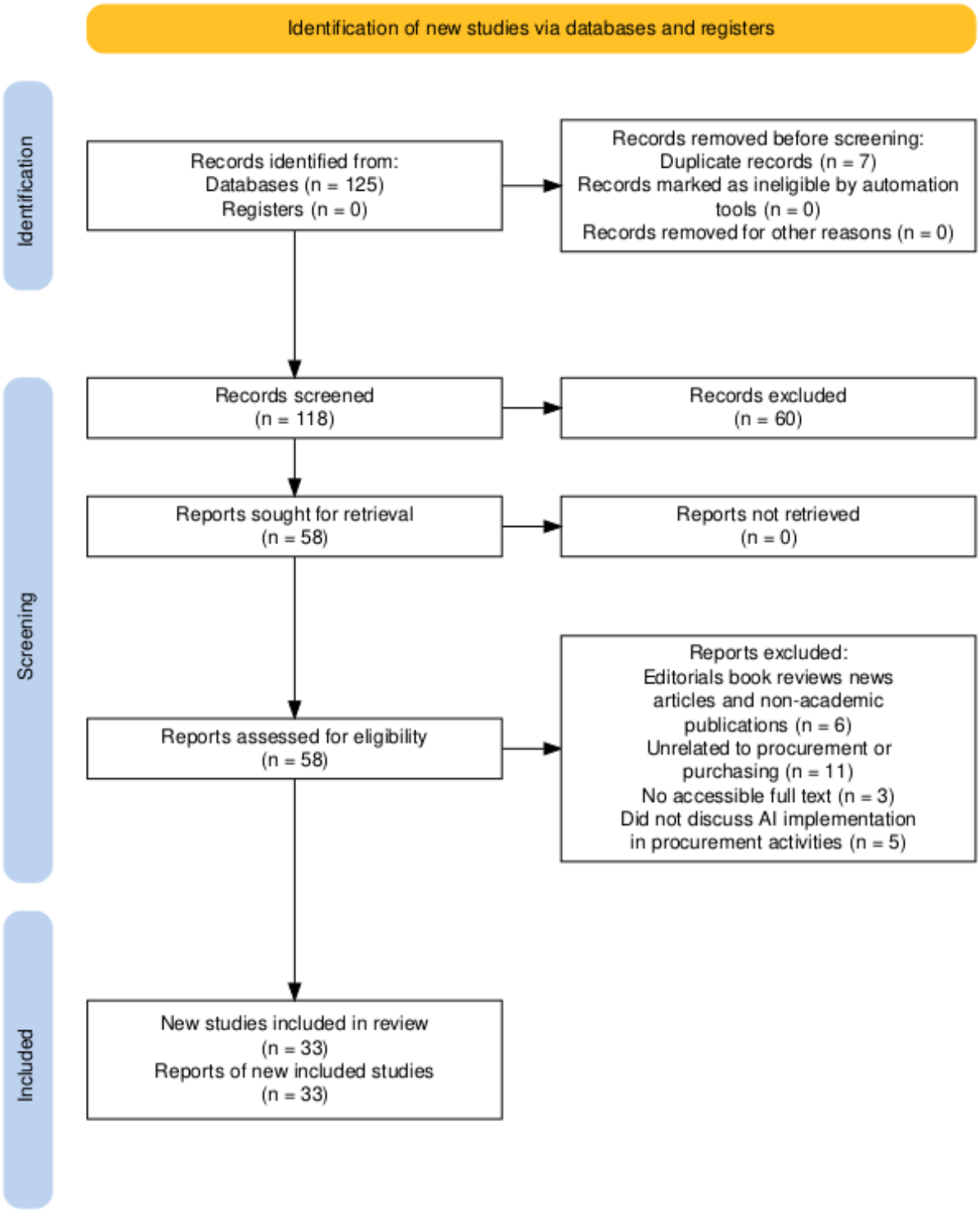


Figure 1. PRISMA 2020 Flow Diagram

Data Extraction and Coding

Following the selection process, information from each eligible study was systematically extracted using a standardized coding framework. The extracted information included bibliographic details, publication year, research objectives, study methodology, AI technologies employed, procurement module addressed, principal findings, and identified research gaps. This structured extraction process ensured consistency during data synthesis while facilitating comparisons across studies.

To answer the research questions, each article was further classified into one of the nine procurement modules adopted in this study. This coding process constituted the primary analytical stage of the review because it enabled AI applications to be examined according to procurement activities rather than solely according to technological characteristics.

RESULTS

AI Adoption Across Procurement Modules

The systematic review demonstrates that artificial intelligence (AI) has been implemented across the entire procurement lifecycle, although the extent and characteristics of adoption vary considerably among procurement modules. Rather than concentrating exclusively on purchasing automation, recent studies indicate that AI increasingly supports analytical, operational, and strategic procurement activities. The reviewed literature reveals that AI adoption spans nine major procurement modules: spend analysis, strategic sourcing, supplier selection, contract management, purchase requisition, purchase order management, invoice processing, supplier relationship management, and supplier risk management. Nevertheless, research attention is unevenly distributed, with supplier-oriented and sourcing-related modules receiving substantially greater scholarly attention than transactional procurement activities.

Evidence from the reviewed studies indicates that supplier selection represents one of the most extensively investigated procurement modules. Numerous empirical studies have developed machine learning, explainable AI, and hybrid decision-support models to improve supplier evaluation accuracy, reduce subjectivity, and support multi-criteria procurement decisions. For example, Abdulla and Baryannis (2024) proposed an explainable machine learning framework that improves supplier evaluation while maintaining decision transparency. Similar conclusions were reported by Khan et al., 2023; Mirzaee & Ashtab, 2024; Sahoo et al., 2024; Tajally et al., 2025 who consistently demonstrated that AI-assisted supplier selection enhances procurement effectiveness by integrating multiple evaluation criteria and reducing human bias. The concentration of empirical studies within this module indicates that supplier evaluation remains one of the most mature research domains in AI-enabled procurement.

The literature also demonstrates substantial AI adoption within strategic sourcing, where intelligent systems increasingly support procurement planning and sourcing optimization. Reitsma et al. (2025) reported that AI-assisted sourcing enables organizations to evaluate sourcing alternatives more effectively by integrating multiple procurement variables into strategic decision-making. Likewise, Frederico et al., (2021) emphasized that intelligent sourcing strengthens supply chain responsiveness during market disruptions, whereas Ghosh et al. (2021) demonstrated that AI supports sustainable sourcing by balancing economic and environmental procurement objectives. More recently, Hunger et al. (2025) highlighted the growing application of AI in sourcing critical raw materials, reflecting the increasing strategic importance of predictive analytics within procurement planning.

Compared with supplier-related procurement modules, operational procurement activities primarily emphasize process automation and transactional efficiency. Studies concerning purchase order management, purchase requisition, and invoice processing consistently report that AI technologies reduce administrative workloads, improve document accuracy, and accelerate procurement workflows. Kim et al. (2022) demonstrated that AI-assisted purchase order validation improves transaction accuracy while reducing operational risks. Similarly, Maheshwari et al. (2026) and Li et al. (2025) found that

procurement automation significantly shortens purchasing cycles through intelligent workflow management. Within invoice processing, Baviskar et al. (2021), Arslan et al. (2024), and Azman et al. (2021) showed that intelligent document processing substantially improves invoice extraction accuracy while reducing processing time and operational costs. These findings suggest that operational procurement modules have achieved relatively advanced AI implementation due to the availability of structured transactional data.

Emerging procurement modules exhibit a different pattern of AI adoption. Studies focusing on contract management, supplier relationship management, and supplier risk management increasingly investigate AI as a strategic decision-support capability rather than a process automation tool. Dikmen et al. (2025), Tang et al. (2026), and Zhou et al. (2025) demonstrated that natural language processing and large language models improve contract analysis by automating clause extraction and compliance assessment. In supplier relationship management, Hoffreumon et al. (2024) and van Hoek (2024) reported that AI facilitates supplier communication, performance monitoring, and collaborative decision-making. Meanwhile, supplier risk studies by Fallah Lajimi et al. (2026), Hickok (2024), Joshi et al. (2026), and Wu et al. (2025) indicate that predictive AI increasingly supports proactive risk identification and procurement resilience. These findings demonstrate that AI adoption is progressively expanding beyond operational efficient toward strategic procurement governance and organizational resilience.

Overall, the reviewed literature reveals that AI adoption across procurement modules reflects different stages of technological development and organizational priorities. Modules characterized by repetitive transactions primarily employ AI to automate operational processes, whereas strategic procurement modules increasingly utilize AI to augment managerial judgment, optimize complex decision-making, and strengthen supplier collaboration. This uneven distribution of AI applications suggests that future procurement research should focus on integrating AI capabilities across procurement modules to establish more intelligent, connected, and resilient procurement ecosystems.

Table 1. AI Adoption Across Procurement Modules

Procurement Module	Main AI Applications	Dominant Research Focus	Representative Empirical Studies
Spend Analysis	Spend classification, demand forecasting, anomaly detection	Procurement analytics	(Bafna et al., 2024; Cui et al., 2022; Spreitzenbarth et al., 2024)
Strategic Sourcing	Supplier discovery, sourcing optimization, scenario analysis	Strategic decision support	(Frederico et al., 2021; Ghosh et al., 2021; Hunger et al., 2025; Reitsma et al., 2025)
Supplier Selection	Supplier evaluation, supplier ranking, multi-criteria decision-making	AI-based supplier evaluation	(Abdulla & Baryannis, 2024; Khan et al., 2023; Mirzaee & Ashtab, 2024; Sahoo et al., 2024; Tajally et al., 2025)
Contract Management	Contract review, compliance analysis, clause extraction	Intelligent document analysis	(Aejas et al., 2025; Dikmen et al., 2025; Tang et al., 2026; Zhou et al., 2025)
Purchase Requisition	Approval recommendation, requisition automation	Workflow automation	(Spreitzenbarth et al., 2024)
Purchase Order Management	Purchase order validation, order processing	Process automation	(Kim et al., 2022; Li et al., 2025; Maheshwari et al., 2026)
Invoice Processing	Invoice extraction, document validation	Intelligent document processing	(Arslan et al., 2024; Azman et al., 2021; Baviskar et al., 2021)
Supplier Relationship Management	Supplier communication, supplier monitoring	AI-assisted collaboration	(Hoffreumon et al., 2024; van Hoek, 2024)

Procurement Module	Main AI Applications	Dominant Research Focus	Representative Empirical Studies
Supplier Risk Management	Risk prediction, disruption monitoring	Predictive risk management	(Fallah Lajimi et al., 2026; Hickok, 2024; Joshi et al., 2026; Wu et al., 2025)

Dominant AI Technologies Across Procurement Modules

The reviewed studies demonstrate that artificial intelligence technologies are not uniformly implemented across procurement modules. Instead, technology adoption is determined by the nature of procurement tasks, data characteristics, and decision complexity. Across the selected literature, machine learning, natural language processing (NLP), predictive analytics, robotic process automation (RPA), Generative AI, and large language models (LLMs) emerged as the principal technologies supporting procurement activities. While analytical procurement modules predominantly employ predictive machine learning algorithms, document-intensive procurement processes increasingly rely on NLP and LLM-based applications, indicating a gradual diversification of AI technologies throughout the procurement lifecycle.

Machine learning (ML) remains the most extensively applied technology within supplier selection and strategic sourcing. Abdulla & Baryannis (2024) demonstrated that explainable machine learning models improve supplier evaluation by increasing prediction transparency without compromising classification performance. Similar findings were reported by Khan et al. (2023), who integrated machine learning with the SCOR framework to strengthen supplier performance assessment, while Sahoo et al. (2024) concluded that ML-based approaches consistently outperform conventional multi-criteria decision-making techniques when evaluating supplier capabilities under uncertain procurement conditions. Furthermore, Tajally et al. (2025) proposed hybrid AI models capable of simultaneously improving supplier ranking accuracy and procurement decision consistency, whereas Mirzaee and Ashtab (2024) observed that recent supplier selection studies increasingly combine multiple AI algorithms to address economic, environmental, and social procurement objectives. Collectively, these empirical findings indicate that machine learning has become the dominant decision-support technology for supplier-related procurement activities.

A similar pattern is evident within strategic sourcing, where AI technologies are primarily employed to optimize sourcing decisions and improve procurement planning. Reitsma et al. (2025) reported that AI-assisted sourcing models enhance supplier identification and sourcing strategy formulation by simultaneously evaluating multiple sourcing variables. Likewise, Frederico et al. (2021) emphasized that intelligent sourcing contributes to greater supply chain responsiveness during periods of disruption, while Ghosh et al. (2021) demonstrated that AI-supported sourcing enables organizations to balance cost efficiency with environmental sustainability objectives. More recently, Hunger et al. (2025) highlighted the growing application of AI in sourcing critical raw materials, suggesting that predictive analytics increasingly supports procurement resilience under uncertain market conditions. These studies collectively demonstrate that AI has transformed strategic sourcing from a transactional purchasing activity into an evidence-driven strategic decision process.

Document-intensive procurement modules exhibit a different technological profile. Studies focusing on contract management consistently identify natural language processing (NLP) and large language models (LLMs) as the dominant AI technologies. Dikmen et al. (2025) showed that NLP substantially improves contract review by automatically extracting contractual clauses and identifying compliance risks. Likewise, Zhou et al. (2025) demonstrated that deep learning techniques enhance legal document classification and contract analytics, while Tang et al. (2026) illustrated how LLM-based systems support intelligent contract interpretation and procurement knowledge retrieval. In parallel, Aejas et al. (2025) reported that AI-driven contract automation reduces administrative workloads and improves contractual consistency. Together, these studies indicate that language-based AI technologies are increasingly replacing manual document analysis in procurement.

Operational procurement modules, including purchase order management and invoice processing, primarily employ AI technologies designed to automate repetitive administrative activities. (Kim et al., 2022) found that AI-assisted purchase order systems improve procurement accuracy and reduce operational risks through automated validation and anomaly detection. Similarly, Li et al. (2025) and Maheshwari et al. (2026) reported that intelligent procurement automation accelerates purchasing workflows while reducing manual intervention. Within invoice processing, Baviskar et al. (2021) demonstrated that combining OCR with AI significantly improves invoice recognition accuracy, whereas Arslan et al. (2024) and Azman et al. (2021) highlighted the effectiveness of intelligent document processing in reducing processing time and administrative costs. These findings suggest that operational procurement modules have achieved relatively higher levels of automation due to their standardized processes and structured data.

Table 2. Dominant AI Technologies Across Procurement Modules

Procurement Module	Dominant AI Technology	Primary Applications	Representative Studies	Key Findings
Spend Analysis	Machine Learning, Predictive Analytics	Spend classification, anomaly detection, demand forecasting	(Bafna et al., 2024; Cui et al., 2022; Spreitzenbarth et al., 2024)	AI improves expenditure visibility, spending prediction, and strategic budgeting through automated data analysis.
Strategic Sourcing	Machine Learning, Predictive Analytics, Generative AI	Supplier discovery, sourcing optimization, scenario analysis	(Frederico et al., 2021; Ghosh et al., 2021; Hunger et al., 2025; Reitsma et al., 2025)	AI enhances sourcing decisions by integrating multiple evaluation criteria, improving resilience, and supporting sustainable sourcing strategies.
Supplier Selection	Machine Learning, Explainable AI	Supplier evaluation, ranking, multi-criteria decision support	(Abdulla & Baryannis, 2024; Khan et al., 2023; Mirzaee & Ashtab, 2024; Sahoo et al., 2024; Tajally et al., 2025)	ML-based approaches improve supplier evaluation accuracy, reduce decision bias, and increase transparency in supplier assessment.
Contract Management	NLP, Deep Learning, LLM	Contract review, clause extraction, compliance analysis	(Aejas et al., 2025; Dikmen et al., 2025; Tang et al., 2026; Zhou et al., 2025)	NLP and LLM automate contract analysis, reduce legal risks, and improve compliance monitoring.
Purchase Requisition	Machine Learning, RPA	Requisition validation, approval recommendation	(Spreitzenbarth et al., 2024)	AI supports requisition processing by improving workflow efficiency and reducing manual intervention.
Purchase Order Management	Machine Learning, RPA	Order validation, workflow automation	(Kim et al., 2022; Li et al., 2025; Maheshwari et al., 2026)	AI accelerates purchase order processing while improving operational accuracy and reducing administrative effort.

Procurement Module	Dominant AI Technology	Primary Applications	Representative Studies	Key Findings
Invoice Processing	OCR, NLP, Machine Learning	Invoice extraction, validation, fraud detection	(Arslan et al., 2024; Azman et al., 2021; Baviskar et al., 2021)	Intelligent document processing reduces processing time, increases extraction accuracy, and minimizes manual errors.
Supplier Relationship Management	Generative AI, Predictive Analytics	Supplier communication, performance monitoring, collaboration	(Guida et al., 2023; Hoffreumon et al., 2024; van Hoek, 2024)	AI strengthens supplier collaboration through intelligent communication and performance monitoring.
Supplier Risk Management	Machine Learning, Predictive Analytics, LLM	Risk prediction, disruption monitoring, supplier resilience	(Fallah Lajimi et al., 2026; Hickok, 2024; Joshi et al., 2026; Wu et al., 2025)	AI enables proactive supplier risk identification and supports resilient procurement decision-making.

Organizational Benefits of AI in Procurement

The reviewed literature consistently demonstrates that the adoption of artificial intelligence generates substantial organizational benefits across procurement modules. Although individual studies emphasize different procurement activities and technological approaches, the overall evidence indicates that AI contributes to improved decision quality, operational efficiency, procurement transparency, supplier collaboration, and organizational resilience. Rather than serving merely as an automation tool, AI increasingly functions as a strategic organizational capability that supports procurement professionals in making faster, more informed, and evidence-based decisions. Guida et al. (2023) highlighted that AI enhances procurement performance by enabling intelligent decision support across multiple procurement activities, while Spreitzenbarth et al. (2024) argued that AI significantly improves purchasing intelligence through advanced analytics and machine learning techniques. Collectively, these findings suggest that AI creates value by strengthening both operational execution and strategic procurement management.

One of the most frequently reported organizational benefits concerns improved procurement decision-making. Across procurement modules such as spend analysis, strategic sourcing, and supplier selection, AI enables organizations to analyze large volumes of procurement data, identify hidden patterns, forecast purchasing requirements, and evaluate supplier alternatives with greater accuracy than conventional analytical approaches. Reitsma et al. (2025) demonstrated that AI-supported strategic sourcing improves sourcing decisions by integrating multiple decision variables simultaneously, whereas Abdulla and Baryannis (2024) showed that explainable machine learning enhances supplier evaluation by increasing both prediction accuracy and decision transparency. Similarly, Khan et al. (2023) and Sahoo et al. (2024) reported that AI-based supplier selection models improve decision consistency while reducing subjective bias associated with traditional supplier evaluation methods.

Another major benefit identified across the reviewed studies is the improvement of operational efficiency and process automation. AI technologies automate repetitive procurement activities, reduce administrative workloads, accelerate document processing, and minimize human error throughout procurement operations. Althabatah et al. (2023) explained that Procurement 4.0 technologies enable organizations to streamline procurement workflows through intelligent automation and digital integration. Supporting this perspective, Dikmen et al. (2025) found that natural language processing substantially reduces the time required for contract review by automatically identifying contractual clauses and compliance risks. Likewise, studies on invoice processing demonstrate that AI-supported

document analysis improves processing speed, data accuracy, and operational consistency while lowering transaction costs.

Beyond efficiency improvements, the literature increasingly highlights AI's contribution to organizational resilience and supplier collaboration. van Hoek (2024) argued that Generative AI supports procurement professionals by facilitating knowledge management, supplier communication, procurement planning, and organizational learning during periods of uncertainty. Similarly, (Lakhal et al., 2025) emphasized that AI enhances end-to-end procurement visibility across the source-to-pay process, enabling organizations to respond more effectively to supply chain disruptions and changing market conditions. These findings indicate that AI contributes not only to operational optimization but also to stronger organizational adaptability and long-term procurement resilience.

The reviewed studies also reveal that AI increasingly supports sustainability and strategic value creation within procurement management. Rather than focusing exclusively on cost reduction, contemporary AI applications assist organizations in incorporating environmental, social, and governance (ESG) considerations into procurement decision-making. Modgil et al. (2025) demonstrated that Generative AI facilitates sustainable procurement by supporting supplier assessment, sustainability reporting, and strategic procurement planning. Likewise, Ghosh et al. (2021) emphasized that intelligent sourcing decisions improve organizational performance by simultaneously considering economic, environmental, and operational objectives. These findings suggest that AI enables procurement to evolve from a cost-oriented administrative function toward a strategic capability capable of creating long-term organizational value.

Table 3. Organizational Benefits of AI Across Procurement Modules

Procurement Module	Organizational Benefits	Representative Evidence	Representative Studies
Spend Analysis	Improved expenditure visibility, demand forecasting, anomaly detection, strategic budgeting	AI-enabled analytics improves spending transparency and supports evidence-based procurement planning.	(Bafna et al., 2024; Cui et al., 2022; Spreitzenbarth et al., 2024)
Strategic Sourcing	Better sourcing decisions, supply resilience, sustainable sourcing, supplier discovery	AI assists procurement professionals in evaluating multiple sourcing scenarios while balancing economic and sustainability objectives.	(Frederico et al., 2021; Ghosh et al., 2021; Hunger et al., 2025; Reitsma et al., 2025)
Supplier Selection	Higher supplier evaluation accuracy, reduced bias, transparent decision-making	Machine learning and explainable AI improve supplier ranking and increase confidence in procurement decisions.	(Abdulla & Baryannis, 2024; Khan et al., 2023; Mirzaee & Ashtab, 2024; Sahoo et al., 2024; Tajally et al., 2025)
Contract Management	Faster contract review, improved compliance, reduced legal risks	NLP and LLM applications automate contract analysis and enhance regulatory compliance.	(Aejas et al., 2025; Dikmen et al., 2025; Tang et al., 2026; Zhou et al., 2025)
Purchase Requisition	Shorter approval cycle, improved workflow consistency	Intelligent workflow automation accelerates requisition approval and reduces administrative burden.	(Spreitzenbarth et al., 2024)
Purchase Order Management	Faster transaction processing, reduced operational errors	AI automates purchase order validation and minimizes manual intervention.	(Kim et al., 2022; Li et al., 2025; Maheshwari et al., 2026)

Invoice Processing	Faster invoice processing, higher extraction accuracy, lower processing costs	OCR and AI-based document processing improve invoice validation and operational efficiency.	(Arslan et al., 2024; Azman et al., 2021; Baviskar et al., 2021)
Supplier Relationship Management	Stronger supplier collaboration, continuous supplier monitoring	AI facilitates intelligent communication and supports long-term supplier relationship development.	(Guida et al., 2023; Hoffreumon et al., 2024; van Hoek, 2024)
Supplier Risk Management	Early risk detection, disruption prediction, resilience improvement	AI enables proactive supplier risk monitoring and strengthens procurement resilience.	(Fallah Lajimi et al., 2026; Hickok, 2024; Joshi et al., 2026; Wu et al., 2025)

Challenges of AI Implementation in Procurement

Despite the substantial benefits associated with artificial intelligence adoption, the reviewed literature consistently indicates that AI implementation across procurement modules is accompanied by various technological, organizational, and managerial challenges. Rather than originating from a single factor, these challenges emerge from the interaction between data quality, organizational readiness, governance, system integration, and human capability. The findings suggest that successful AI adoption depends not only on technological sophistication but also on the organizational capacity to effectively integrate AI into procurement processes.

One of the most frequently identified challenges concerns data quality and data availability. AI applications rely heavily on large volumes of accurate, consistent, and representative procurement data; however, procurement datasets are often fragmented across enterprise systems and contain missing or inconsistent information. Abdulla and Baryannis (2024) emphasized that the performance of machine learning models for supplier evaluation is strongly influenced by data completeness and feature quality. Similarly, Sahoo et al. (2024) observed that many supplier selection models remain difficult to implement in practice because of limited access to high-quality procurement datasets, while Khan et al. (2023) highlighted that inconsistent supplier performance data reduces the effectiveness of AI-driven procurement decisions. These studies collectively demonstrate that data quality remains a critical prerequisite for reliable AI implementation.

Another major challenge relates to model transparency and explainability. Although advanced machine learning algorithms generally achieve high predictive performance, procurement professionals often require transparent decision processes to justify supplier selection, sourcing strategies, and contractual decisions. Abdulla and Baryannis (2024) proposed Explainable Artificial Intelligence (XAI) to improve the interpretability of supplier evaluation models, enabling procurement practitioners to understand the rationale underlying AI-generated recommendations. Likewise, Mirzaee and Ashtab (2024) emphasized that future AI applications should balance predictive accuracy with explainability to strengthen managerial trust and facilitate organizational adoption. These findings indicate that explainability is becoming an increasingly important requirement for AI-supported procurement decision-making.

The literature further identifies organizational readiness and digital capability as major determinants of successful AI implementation. van Hoek (2024) reported that procurement organizations frequently encounter challenges related to employee digital competencies, organizational adaptation, and managerial acceptance when adopting Generative AI. Similarly, Althabatah et al. (2023) argued that Procurement 4.0 requires substantial investments in employee training, process redesign, leadership commitment, and organizational change management in addition to technological infrastructure. Supporting this perspective, Charnor and Quartey (2024) demonstrated that the effectiveness of digital procurement initiatives is influenced not only by technological adoption but also by institutional and organizational readiness. Collectively, these studies suggest that AI implementation represents a socio-technical transformation rather than a purely technological initiative.

Another challenge emerging across the reviewed studies concerns AI governance, ethical considerations, and regulatory compliance. As AI becomes increasingly involved in strategic procurement decisions, concerns regarding algorithmic bias, accountability, data privacy, cybersecurity, and regulatory compliance become more significant. Hickok (2024) argued that procurement organizations must establish governance mechanisms capable of ensuring responsible AI deployment while minimizing unintended biases in supplier evaluation and procurement decision-making. Likewise, Modgil et al. (2025) emphasized that susttowardsse procurement requires AI systems that are transparent, fair, and aligned with environmental, social, and governance (ESG) principles. These findings indicate that responsible AI governance is becoming an essential component of future procurement management.

Finally, the reviewed literature highlights system integration and technological interoperability as continuing implementation challenges. AI applications rarely operate independently but instead interact with enterprise resource planning (ERP), e-procurement systems, supplier relationship management platforms, and source-to-pay infrastructures. Lakhal et al. (2025) emphasized that the effectiveness of AI across the source-to-pay process depends on seamless interoperability among interconnected procurement systems. Similarly, Reitsma et al. (2025) noted that fragmented digital infrastructures reduce the effectiveness of AI-supported sourcing decisions despite advances in analytical technologies. Consequently, organizations must prioritize technological integration alongside AI development to achieve end-to-end procurement optimization.

Overall, the reviewed evidence demonstrates that AI implementation challenges extend beyond algorithmic performance and encompass organizational, technological, and governance dimensions. Addressing issues related to data quality, explainability, organizational readiness, responsible AI governance, and system integration will therefore be essential for realizing the long-term strategic value of AI across procurement modules.

Table 4. AI Implementation Challenges Across Procurement Modules

Challenge	Description	Most Affected Procurement Modules	Representative Studies
Data quality and availability	Incomplete, inconsistent, or fragmented procurement data reduce AI model reliability	Spend Analysis, Supplier Selection, Supplier Risk Management	(Abdulla & Baryannis, 2024; Khan et al., 2023; Sahoo et al., 2024)
Explainability and transparency	Black-box AI models reduce managerial trust and decision accountability	Supplier Selection, Strategic Sourcing	(Abdulla & Baryannis, 2024; Mirzaee & Ashtab, 2024)
Organizational readiness	Limited digital capability, employee skills, and change management hinder AI adoption	All Procurement Modules	(Althabatah et al., 2023; Charnor & Quartey, 2024; van Hoek, 2024)
AI governance and ethics	Algorithmic bias, privacy, accountability, and ESG compliance	Supplier Selection, Supplier Risk Management, Contract Management	(Hickok, 2024; Modgil et al., 2025)
System integration	Limited interoperability between AI applications and enterprise procurement systems	Source-to-Pay Process, Purchase Order, SRM	(Lakhal et al., 2025; Reitsma et al., 2025)

AI Maturity Across Procurement Modules

The reviewed literature suggests that AI adoption has not progressed uniformly across procurement modules. Instead, AI maturity varies according to process standardization, data availability, decision complexity, and organizational objectives. Procurement activities characterized by structured data and repetitive workflows generally demonstrate more advanced AI implementation than strategic

procurement functions requiring human judgment and contextual interpretation. This finding indicates that AI maturity should be understood as a continuum rather than a uniform organizational capability.

Operational procurement modules, including invoice processing, purchase order management, and purchase requisition, exhibit relatively high levels of technological maturity because their standardized processes facilitate automation through machine learning, robotic process automation, and intelligent document processing. Studies by Arslan et al. (2024), Azman et al. (2021), Baviskar et al. (2021), Kim et al. (2022), Maheshwari et al. (2026) consistently demonstrate that these modules achieve measurable improvements in processing speed, document accuracy, and administrative efficiency through AI-enabled automation. The availability of structured transactional data further contributes to the successful implementation of intelligent procurement systems within these operational activities.

Overall, the reviewed evidence demonstrates that procurement AI maturity reflects both technological advancement and organizational capability development. While operational procurement modules have reached relatively higher levels of automation, strategic procurement activities continue to evolve toward collaborative intelligence in which AI complements rather than replaces human expertise. This progression suggests that future procurement transformation will increasingly depend on organizations' ability to integrate advanced AI technologies with governance mechanisms, organizational learning, and human decision-making capabilities.

Table 5. AI Maturity Across Procurement Modules

Procurement Module	Current AI Maturity	Dominant AI Role	Evidence
Spend Analysis	High	Predictive analytics	(Bafna et al., 2024; Cui et al., 2022; Spreitzenbarth et al., 2024)
Strategic Sourcing	Medium–High	Decision support	(Ghosh et al., 2021; Reitsma et al., 2025)
Supplier Selection	High	Intelligent decision support	(Abdulla & Baryannis, 2024; Khan et al., 2023; Sahoo et al., 2024)
Contract Management	Medium–High	Document intelligence	(Dikmen et al., 2025; Tang et al., 2026)
Purchase Requisition	Medium	Workflow automation	(Spreitzenbarth et al., 2024)
Purchase Order Management	High	Intelligent automation	(Kim et al., 2022; Li et al., 2025)
Invoice Processing	High	Intelligent document processing	(Arslan et al., 2024; Baviskar et al., 2021)
Supplier Relationship Management	Medium	AI-assisted collaboration	(Hoffreumon et al., 2024; van Hoek, 2024)
Supplier Risk Management	Medium–High	Predictive risk intelligence	(Fallah Lajimi et al., 2026; Hickok, 2024; Wu et al., 2025)

Research Gaps and Future Research Directions

The systematic review reveals that, despite the rapid expansion of artificial intelligence (AI) applications in procurement, the current body of knowledge remains fragmented across procurement modules, technologies, and organizational contexts. While substantial progress has been achieved in developing AI-driven procurement solutions, several important research gaps continue to limit a comprehensive understanding of AI-enabled procurement transformation. The reviewed studies collectively indicate that future research should extend beyond technological performance and increasingly examine organizational, strategic, and governance dimensions of AI implementation.

One of the most evident research gaps concerns the uneven distribution of AI research across procurement modules. The reviewed literature demonstrates that supplier selection, strategic sourcing, and contract management dominate current AI procurement research, whereas comparatively limited attention has been devoted to purchase requisition, purchase order management, invoice processing, and

supplier relationship management. Studies by (Abdulla and Baryannis (2024), Dikmen et al. (2025), Khan et al. (2023), Reitsma et al. (2025) illustrate substantial methodological advances within strategic procurement activities. In contrast, empirical investigations focusing on operational procurement modules remain relatively scarce despite their considerable automation potential. This imbalance suggests that future studies should examine AI adoption across underexplored procurement activities to establish a more comprehensive understanding of end-to-end procurement transformation.

A second gap relates to the rapid emergence of Generative AI and large language models (LLMs). Although recent studies indicate growing interest in these technologies, empirical evidence remains limited compared with the extensive literature on machine learning and predictive analytics. van Hoek (2024) highlighted the managerial opportunities offered by Generative AI within procurement planning and supplier communication, while (Modgil et al. (2025) emphasized its potential contribution to sustainable procurement. Similarly, (Lakhal et al., 2025) discussed AI implementation across the source-to-pay process but acknowledged that evidence regarding the organizational impact of advanced language models remains limited. These findings indicate that future research should investigate how Generative AI and LLMs influence procurement decision-making, organizational learning, and knowledge-intensive procurement activities.

Another important research gap concerns the limited integration of AI governance, explainability, and ethical considerations into procurement research. Although explainable artificial intelligence has attracted increasing attention in supplier selection, particularly through the work of Abdulla and Baryannis, (2024), governance-related issues such as algorithmic transparency, accountability, fairness, privacy, and regulatory compliance remain insufficiently investigated across other procurement modules. Likewise, Hickok (2024) emphasized the importance of responsible AI governance in procurement decision-making, while Modgil et al. (2025) linked AI implementation to broader sustainability and ESG objectives. Collectively, these studies suggest that future research should move beyond algorithm development toward the establishment of governance frameworks capable of ensuring trustworthy and responsible AI adoption.

The reviewed literature also indicates a shortage of studies examining organizational capability development and human–AI collaboration. Existing research predominantly evaluates AI performance from a technological perspective, whereas comparatively few studies investigate how procurement professionals interact with AI systems, develop digital competencies, or adapt procurement processes to support intelligent decision-making. Althabatah et al. (2023) argued that Procurement 4.0 requires organizational transformation extending beyond technological investment, while van Hoek (2024) emphasized that future procurement environments will increasingly depend on collaboration between human expertise and AI-assisted decision support. These findings suggest that organizational readiness, workforce capability, and change management deserve substantially greater scholarly attention.

Finally, the review highlights methodological opportunities for future AI procurement research. Most existing studies rely on cross-sectional case studies, conceptual frameworks, simulation models, or algorithm performance evaluations conducted within specific organizational contexts. Longitudinal investigations, cross-industry comparative studies, multi-country analyses, and real-world implementation research remain relatively limited. Furthermore, only a small number of studies examine the integration of AI across multiple procurement modules rather than focusing on isolated procurement functions. Future systematic investigations adopting holistic, cross-module perspectives may therefore contribute to a more comprehensive understanding of AI-enabled procurement transformation and facilitate the development of integrated procurement intelligence frameworks.

Overall, the identified research gaps indicate that future procurement research should extend beyond improving AI algorithms toward understanding how intelligent technologies create sustainable organizational value across interconnected procurement modules. Addressing these gaps will contribute to both the theoretical advancement of AI-enabled procurement and the practical development of

intelligent procurement systems capable of supporting resilient, transparent, and sustainable procurement management.

Table 6. Research Gaps and Future Research Directions

Research Gap	Current Evidence	Future Research Opportunities	Representative Studies
Uneven research across procurement modules	Research concentrates on supplier selection, strategic sourcing, and contract management	Expand AI research to purchase requisition, purchase order management, invoice processing, and SRM	(Abdulla & Baryannis, 2024; Dikmen et al., 2025; Reitsma et al., 2025)
Limited empirical evidence on Generative AI and LLMs	Existing studies are mainly conceptual or exploratory	Conduct empirical evaluations of Generative AI and LLM applications across procurement modules	(Lakhal et al., 2025; Modgil et al., 2025; van Hoek, 2024)
AI governance and responsible AI	Limited attention to explainability, ethics, privacy, and accountability	Develop AI governance frameworks for procurement decision-making	(Abdulla & Baryannis, 2024; Hickok, 2024; Modgil et al., 2025)
Human–AI collaboration	Organizational capability and workforce adaptation remain underexplored	Examine AI acceptance, organizational learning, and procurement capability development	(Althabatah et al., 2023; van Hoek, 2024)
Limited holistic procurement perspective	Most studies investigate isolated procurement modules	Develop integrated cross-module AI procurement frameworks	(Guida et al., 2023; Lakhal et al., 2025)
Limited methodological diversity	Predominantly case studies and algorithm evaluations	Conduct longitudinal, cross-industry, and cross-country empirical studies	(Charnor & Quartey, 2024; Reitsma et al., 2025)

Discussion

Cross-Module Comparison of AI Adoption

The findings of this systematic literature review indicate that artificial intelligence (AI) adoption differs considerably across procurement modules, reflecting variations in procurement objectives, process characteristics, data availability, and decision complexity. Although AI technologies have expanded throughout the procurement lifecycle, their implementation is concentrated in modules that require analytical decision-making, supplier evaluation, and risk management. The reviewed studies consistently demonstrate that supplier selection, strategic sourcing, and contract management receive substantially greater research attention than operational procurement activities such as purchase requisition, purchase order management, and invoice processing (Abdulla & Baryannis, 2024; Dikmen et al., 2025; Reitsma et al., 2025; Spreitzenbarth et al., 2024). This distribution suggests that current AI research prioritizes procurement functions with higher strategic value and greater potential for improving organizational decision quality, a pattern also highlighted by Guida et al. (2023).

The comparison across procurement modules further demonstrates that AI performs different organizational roles depending on the characteristics of procurement activities. Operational procurement modules primarily utilize AI to automate repetitive, standardized, and transaction-oriented processes. Applications such as invoice extraction, purchase order validation, and document towardsssing improve processing efficiency while reducing administrative workload and human error (Arslan et al., 2024; Baviskar et al., 2021; Kim et al., 2022; Li et al., 2025). In contrast, strategic procurement modules rely on AI to strengthen managerial decision-making by integrating large volumes of structured and unstructured information into procurement analysis. Supplier selection, strategic sourcing, supplier

relationship management, and supplier risk management therefore employ AI as an intelligent decision-support capability rather than as a replacement for procurement professionals (Abdulla & Baryannis, 2024; Khan et al., 2023; Sahoo et al., 2024; van Hoek, 2024). This distinction indicates that the strategic value of AI depends not only on technological capability but also on the organizational context in which procurement decisions are made.

Another important pattern emerging from this review concerns the relationship between AI technologies and procurement tasks. Machine learning dominates procurement modules requiring prediction, optimization, classification, and supplier evaluation, whereas natural language processing and large language models are increasingly applied to contract management and other document-intensive procurement activities (Aejas et al., 2025; Dikmen et al., 2025; Tang et al., 2026; Zhou et al., 2025). Recent studies further demonstrate that Generative AI extends beyond document automation by supporting procurement planning, supplier communication, knowledge management, and collaborative decision-making (Lakhal et al., 2025; Modgil et al., 2025; van Hoek, 2024). Rather than competing with one another, these technologies address different analytical requirements across procurement modules, suggesting that future procurement systems will increasingly integrate multiple AI capabilities within a unified digital procurement environment.

The review also demonstrates a gradual shift in the objectives of AI implementation. Earlier procurement applications largely focused on operational efficiency, transaction automation, and cost reduction. More recent studies associate AI with broader organizational capabilities, including procurement resilience, sustainability, supplier collaboration, strategic sourcing, and proactive risk management (Frederico et al., 2021; Ghosh et al., 2021; Hickok, 2024; Modgil et al., 2025; Wu et al., 2025). This transition reflects the evolution of procurement from a transactional business function toward a strategic capability that contributes directly to organizational competitiveness. Consequently, AI should no longer be viewed solely as an automation technology but as an enabler of evidence-based procurement strategies that improve both operational and strategic performance.

Taken together, these findings suggest that AI-enabled procurement should be conceptualized as an integrated organizational capability rather than a collection of independent technological applications. The reviewed evidence indicates that procurement organizations generate greater value when AI applications are implemented across interconnected procurement modules instead of isolated business processes. This interpretation extends previous procurement literature by emphasizing that successful AI adoption depends on the alignment of technological capabilities, procurement objectives, organizational readiness, and cross-functional integration (Guida et al., 2023; Lakhal et al., 2025; Spreitzenbarth et al., 2024).

Theoretical Contributions

This systematic literature review contributes to the growing body of knowledge on artificial intelligence (AI) in procurement by providing a structured synthesis of AI applications across procurement modules rather than examining individual technologies or isolated procurement functions. Previous review studies have primarily discussed AI from the perspectives of digital transformation, Procurement 4.0, or the source-to-pay process (Guida et al., 2023; Lakhal et al., 2025; Spreitzenbarth et al., 2024). In contrast, this review organizes the existing evidence according to procurement modules, allowing a more comprehensive understanding of how AI technologies create value throughout the procurement lifecycle. This perspective extends the current literature by demonstrating that AI adoption is influenced not only by technological advancement but also by the functional characteristics and strategic importance of each procurement module.

The review further contributes by demonstrating that AI technologies should not be interpreted as universally applicable solutions across procurement activities. Instead, the findings indicate that different AI technologies address different procurement requirements. Machine learning is predominantly apptowardsds predictive and optimization tasks, including supplier selection, spend

analysis, and supplier risk management. Natural language processing and large language models are more suitable for document-intensive activities such as contract management and invoice processing, while Generative AI increasingly supports procurement planning, supplier communication, and organizational knowledge management (Abdulla & Baryannis, 2024; Dikmen et al., 2025; Modgil et al., 2025; van Hoek, 2024). This finding supports a contingency perspective in which the effectiveness of AI depends on the alignment between technological capabilities and procurement task characteristics rather than on the adoption of a single AI solution.

Another theoretical contribution concerns the evolving role of AI within procurement. Earlier procurement research frequently emphasized automation and operational efficiency as the primary outcomes of AI implementation. The reviewed studies, however, indicate that AI increasingly functions as a strategic organizational capability that strengthens decision quality, supplier collaboration, procurement resilience, and sustainability performance (Frederico et al., 2021; Ghosh et al., 2021; Hickok, 2024; Wu et al., 2025). This transition suggests that AI should be viewed not merely as a technological innovation but as an organizational capability that enables evidence-based procurement management. Such an interpretation aligns with recent discussions on intelligent procurement while extending previous reviews through a systematic comparison across procurement modules (Guida et al., 2023; Spreitzenbarth et al., 2024).

Finally, this review contributes to procurement research by identifying important gaps that remain insufficiently addressed in the existing literature. Despite the increasing number of AI-related studies, empirical evidence remains concentrated within supplier-oriented procurement activities, whereas operational procurement modules and crtowardsrdsle AI integration receive comparatively limited attention. Furthermore, topics such as AI governance, explainability, human-AI collaboration, and responsible AI adoption remain underrepresented despite their growing practical significance (Abdulla & Baryannis, 2024; Hickok, 2024; Lakhal et al., 2025). By synthesizing these patterns, this review provides a conceptual foundation for future research aimed at developing integrated, trustworthy, and sustainable AI-enabled procurement systems.

Managerial Implications

The findings of this systematic literature review provide several managerial implications for organizations seeking to integrate artificial intelligence (AI) into procurement activities. First, the review demonstrates that AI implementation should be aligned with the specific objectives and characteristics of individual procurement modules rather than adopting a standardized implementation strategy. Procurement activities differ substantially in terms of decision complexity, data availability, and operational requirements. Consequently, organizations should prioritize AI technologies according to the functional needs of each module. Machine learning is particularly suitable for supplier evaluation, spend analysis, and supplier risk management, whereas natural language processing and large language models are more appropriate for contract management and document-intensive procurement activities (Abdulla & Baryannis, 2024; Dikmen et al., 2025; Lakhal et al., 2025). This module-specific implementation approach is likely to improve AI effectiveness while reducing implementation risks and unnecessary technology investments.

Second, the review indicates that successful AI adoption requires organizations to move beyond process automation toward strategic capability development. Although operational efficiency remains an important objective, recent studies consistently demonstrate that AI generates greater organizational value when it supports strategic sourcing, supplier collaboration, procurement resilience, and evidence-based decision-making (Frederico et al., 2021; Ghosh et al., 2021; Modgil et al., 2025; van Hoek, 2024). Procurement managers should therefore position AI as an organizational capability that complements managerial expertise instead of viewing it solely as a cost-reduction tool. This perspective encourages organizations to redesign procurement processes so that AI supports human decision-making while

procurement professionals continue to provide strategic judgment, contextual knowledge, and ethical oversight.

The review also highlights the importance of organizational readiness in determining the success of AI implementation. Investments in AI technologies alone are unlikely to produce sustainable improvements without corresponding investments in data governance, digital infrastructure, employee capabilities, and change management. Several studies emphasize that poor data quality, fragmented procurement systems, and limited digital competencies remain significant barriers to AI adoption (Althabatah et al., 2023; Charnor & Quartey, 2024; Hickok, 2024). Procurement leaders should therefore establish organizational policies that strengthen data quality, promote cross-functional collaboration, and develop digital competencies capable of supporting AI-enabled procurement processes. Such initiatives are particularly important because AI performance depends heavily on the quality and reliability of procurement data.

Another managerial implication concerns AI governance and responsible implementation. As AI increasingly supports supplier selection, contract analysis, and procurement risk assessment, organizations should establish governance mechanisms that ensure transparency, accountability, fairness, and regulatory compliance. Explainable AI, human oversight, and clearly defined governance structures can improve managerial trust while reducing the risks associated with algorithmic bias and automated decision-making (Abdulla & Baryannis, 2024; Hickok, 2024; Modgil et al., 2025). Integrating these governance principles into procurement policies will enable organizations to maximize the benefits of AI while maintaining responsible procurement practices.

Overall, the reviewed evidence suggests that procurement managers should adopt a strategic and integrated approach to AI implementation. Rather than introducing AI as isolated technological solutions, organizations should develop interconnected AI capabilities that support collaboration across procurement modules, strengthen organizational learning, and improve long-term procurement performance. Such an approach is more likely to generate sustainable competitive advantage than isolated automation initiatives because it aligns technological innovation with organizational strategy and procurement objectives (Guida et al., 2023; Lakhal et al., 2025; Spreitzenbarth et al., 2024).

Future Research Agenda

The findings of this systematic literature review indicate several promising directions for future research on artificial intelligence (AI) in procurement. Although AI applications have expanded considerably in recent years, existing studies remain unevenly distributed across procurement modules, organizational contexts, and technological approaches. Future research should therefore move beyond isolated AI applications and investigate how different AI technologies can be integrated throughout the procurement lifecycle to support end-to-end procurement management. Such an approach would provide a more comprehensive understanding of AI-enabled procurement transformation while addressing the fragmentation observed in the current literature (Guida et al., 2023; Lakhal et al., 2025; Spreitzenbarth et al., 2024).

One important research direction involves strengthening empirical evidence across underexplored procurement modules. Existing studies predominantly focus on supplitowardsrdstion, strategic sourcing, and contract management, whereas purchase requisition, purchase order management, invoice processing, and supplier relationship management remain comparatively underrepresented. Expanding empirical investigations into these modules would provide a more balanced understanding of AI adoption and facilitate comparisons between operational and strategic procurement activities. In addition, future studies should examine how AI implementation within one procurement module influences the performance of other interconnected modules, thereby contributing to the development of integrated procurement systems rather than isolated technological solutions (Guida et al., 2023; Reitsma et al., 2025; van Hoek, 2024).

Another promising direction concerns the growing role of Generative AI and large language models in procurement. While recent publications demonstrate increasing interest in these technologies, empirical evidence regarding their organizational impact remains limited. Future research should evaluate how Generative AI influences procurement decision quality, knowledge management, supplier collaboration, contract administration, and organizational learning under real operational conditions. Comparative studies examining the performance of conventional machine learning techniques, large language models, and hybrid AI architectures would also provide valuable theoretical and practical insights into technology selection across different procurement modules (Lakhal et al., 2025; Modgil et al., 2025; van Hoek, 2024).

The review also suggests that future studies should place greater emphasis on organizational and governance perspectives. Much of the existing literature evaluates AI primarily from a technological standpoint, whereas comparatively limited attention has been devoted to organizational capability development, AI governance, ethical decision-making, explainability, and human-AI collaboration. Investigating these dimensions would contribute to a broader understanding of how organizations can implement AI responsibly while maintaining transparency, accountability, and managerial oversight. Such research is expected to become increasingly important as procurement decisions become more dependent on intelligent systems and automated analytical capabilities (Abdulla & Baryannis, 2024; Althabatah et al., 2023; Hickok, 2024).

Finally, future research would benefit from greater methodological diversity. The reviewed studies are dominated by case studies, conceptual frameworks, simulation models, and algorithm performance evaluations. Longitudinal studies, cross-country comparisons, cross-industry investigations, and mixed-methods research remain relatively limited despite their potential to improve the external validity of AI procurement research. Furthermore, comparative investigations involving organizations with different levels of digital maturity may provide valuable insights into the factors that facilitate or hinder successful AI implementation across procurement modules. Expanding methodological diversity will strengthen both theoretical development and practical relevance while supporting the evolution of procurement research toward a more mature and evidence-based discipline (Charnor & Quartey, 2024; Guida et al., 2023; Spreitzenbarth et al., 2024).

Overall, the future development of AI-enabled procurement research should extend beyond improving algorithmic performance toward understanding how intelligent technologies reshape procurement strategy, organizational capabilities, and sustainable value creation. Advancing this broader research agenda will contribute to the development of integrated procurement ecosystems in which AI supports not only operational efficiency but also resilient, transparent, and strategically aligned procurement management.

CONCLUSION

This systematic literature review examined the application of artificial intelligence (AI) across procurement modules by synthesizing the existing body of knowledge from recent academic literature. The findings demonstrate that AI adoption has expanded throughout the procurement lifecycle, although its implementation remains uneven across procurement modules. Strategic procurement activities, particularly supplier selection, strategic sourcing, contract management, and supplier risk management, have received substantially greater research attention than operational procurement functions such as purchase requisition, purchase order management, and invoice processing. Furthermore, the review indicates that different AI technologies serve different procurement objectives. Machine learning is primarily employed for prediction and optimization, natural language processing supports document-intensive procurement activities, and Generative AI increasingly facilitates procurement planning, supplier communication, and knowledge management. Collectively, these

findings suggest that AI should be viewed as an integrated organizational capability rather than a collection of isolated technological applications.

This review also contributes to the procurement literature by organizing AI applications according to procurement modules, providing a comprehensive perspective that complements previous reviews focusing primarily on individual AI technologies or the source-to-pay process. The synthesis demonstrates that successful AI implementation depends on the alignment between technological capabilities, procurement objectives, organizational readiness, and governance mechanisms. Consequently, the study extends current knowledge by highlighting the importance of adopting a cross-module perspective when evaluating AI-enabled procurement transformation.

From a managerial perspective, the findings indicate that organizations should implement AI strategically by considering the specific characteristics of each procurement module instead of applying uniform technological solutions across the procurement function. Investments in AI should therefore be accompanied by improvemtowardsds data quality, digital infrastructure, workforce capabilities, organizational governance, and responsible AI practices to maximize long-term procurement performance. Integrating AI across interconnected procurement modules may also strengthen organizational resilience, improve supplier collaboration, and enhance evidence-based decision-making.

Despite these contributions, several limitations should be acknowledged. This review is limited to the published literature included within the defined search strategy and selection criteria, which may exclude emerging studies not indexed in the selected databases or published after the review period. In addition, the rapid evolution of AI technologies, particularly Generative AI and large language models, indicates that the evidence base continues to develop and may change as new empirical studies become available. Future research should therefore expand empirical investigations across underexplored procurement modules, examine cross-module AI integration, evaluate responsible AI governance, and explore human-AI collaboration through longitudinal, cross-industry, and cross-country research designs. Advancing these research directions will contribute to the development of intelligent procurement systems that are not only technologically advanced but also strategically aligned, transparent, resilient, and capable of supporting sustainable organizational value creation.

Recommendations

Recommendations for Procurement Practitioners

Procurement professionals should adopt AI as a decision-support capability rather than as a substitute for managerial expertise. AI technologies can improve supplier evaluation, sourcing decisions, contract analysis, and procurement risk management when integrated with professional judgment and organizational knowledge. Procurement practitioners should therefore strengthen their analytical competencies, digital literacy, and understanding of AI-assisted decision-making to maximize the benefits of intelligent procurement systems. Continuous training and interdisciplinary collaboration between procurement specialists and data analytics teams are also essential to ensure that AI-generated recommendations are interpreted appropriately within organizational contexts.

Recommendations for Organizations

Organizations should implement AI through a phased and strategically aligned transformation roadmap instead of deploying isolated technological solutions. AI investments should prioritize procurement modules where organizational benefits are expected to be greatest while simultaneously improving data governance, enterprise system integration, and digital infrastructure. Organizations should also establish governance mechanisms that promote transparency, explainability, accountability, and ethical AI implementation. In addition, leadership commitment and organizational change management should accompany technological investments to facilitate employee acceptance and sustainable AI adoption across procurement functions.

Recommendations for Future Researchers

Future studies should expand empirical investigations across procurement modules that remain underrepresented in the current literature, particularly purchase requisition, purchase order management, invoice processing, and supplier relationship management. Researchers are also encouraged to examine AI integration across multiple procurement modules rather than investigating isolated procurement activities. Additional attention should be devoted to emerging topics such as Generative AI, large language models, explainable AI, AI governance, human-AI collaboration, and sustainable procurement. Methodologically, future research would benefit from longitudinal studies, cross-country comparisons, cross-industry analyses, and mixed-methods approaches to provide stronger empirical evidence regarding the organizational impact of AI-enabled procurement.

ACKNOWLEDGEMENTS OR NOTES

The authors would like to express their sincere appreciation to all researchers whose studies contributed to the development of this systematic literature review. Their valuable contributions have significantly advanced the understanding of artificial intelligence applications across procurement modules.

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