

# EMERGING AMBIDEXTROUS OPPORTUNITIES: HOW MALAYSIAN GLCS CAN LEVERAGE ARTIFICIAL INTELLIGENCE

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## ABSTRACT

Government-linked companies (GLCs) are integral to Malaysia's economic growth, operating under substantial government ownership and control across various sectors. In the digital era, it is crucial for GLCs to adopt advanced technologies, particularly artificial intelligence (AI), to enhance their performance and remain competitive against non-GLCs. This study investigates the role of AI in GLCs to provide ambidextrous opportunities, addressing the research gap focused on AI adoption and potential impact in Malaysian GLCs. A Systematic Literature Review (SLR) was conducted using the PRISMA method to analyze 48 peer-reviewed articles from the Web of Science (WOS) and Scopus databases, published between 2013 and 2024. The results revealed various roles of AI that can be leveraged by GLCs as ambidextrous opportunities, including automating financial tasks and services, enhancing transparency in procurement, optimizing supply chain resources, improving public administration, strengthening policy governance, optimizing marketing efforts, enhancing human resource management, boosting corporate readiness, optimizing energy management, managing sustainable natural resources, revolutionizing healthcare, implementing smart farming, enhancing e-commerce strategies, optimizing renewable energy utilization, enhancing smart grid management, increasing organizational agility, developing managerial skills, enhancing product development, and improving manufacturing efficiency. The study provides managerial recommendations for integrating AI across various sectors, aiming to boost competitiveness, operational efficiency, and innovation. This research contributes to the literature by offering practical insights and strategic guidance for policymakers and managers in leveraging AI to create ambidextrous opportunities, ensuring sustained growth and competitiveness in the digital age. This study recommends future research focus on the issues and challenges of leveraging AI in GLCs.

**Keywords:** *Artificial intelligence, government-linked companies, ambidextrous opportunities, digital transformation, adoption, systematic literature review, technology*

## 1. INTRODUCTION

Government-linked companies (GLCs) are companies where the majority is owned by the government through its shares, agencies, or holding entities. These are commercial enterprises but are subject to significantly higher government ownership and control. GLCs can be partially or fully owned by the government and operate in different sectors of the economy [1-3]. GLCs are a major part of the Malaysian economy, making significant contributions to gross capital formation and Gross Domestic Product (GDP). They are important in sectors such as energy management and

construction, natural resource management, healthcare, energy and power, agricultural, energy and environmental management, e-commerce, public administration and governance, education, financial services, supply chain and logistics, marketing, banking and financial, public service, and manufacturing, ensuring stability and sustained economic growth [2].

GLCs have been benchmarked and proven to have improved their performance, particularly after the government's transformation initiatives [4]. However, GLCs still underperformed in terms of performance and profits compared to non-GLCs [5].

Non-GLCs are usually more market-oriented and competitive than GLCs. This is due to the legacy structure and government collaborations of GLCs, which impact their competitive pursuits in both domestic and international markets [6].

Some GLCs are actively engaged in adopting current technologies, whereas others might still lag behind in technological development. More than a decade ago, Wong and Govindaraju [7] points out that the GLCs such as Proton and Golden Hope exhibited significant technological advancements, whereas TNB lacked the necessary technological development to enhance performance. This evidence proved that the technology become important factor to enhance the GLCs performance.

Moreover, the utilization of artificial intelligence (AI) in the private sector enhances private companies' performance, enabling more businesses to compete in the market and improve profitability [8]. AI refers to intelligence demonstrated by machines and is one of the sub-fields of computer science. These tasks encompass learning, reasoning, problem-solving, perception, and natural language processing. Machine learning, deep learning, and other sophisticated computational techniques simulate human cognitive functions using AI technologies [9, 10], in order to derive higher performances by organizations and greater efficiencies within a competitive market [8, 11].

Additionally, AI can offer organizations ambidextrous opportunities to achieve better performance and efficiencies [12-15]. Ambidextrous opportunities refer to the set of favorable conditions for organizations that allow them to exploit what currently exists while exploring new possibilities, which quite often lead to potential benefit, advantage, or gain. Exploration, for instance through new experimentations and market entries, can be said to be the opposite of exploitation. Often described as efficiency enhancement and operation optimization, the two have to find a good strategic balance. Organizational ambidexterity is the construct in organizational theory that is critical to maintain competitiveness and promote innovation [15]. Sourcing ambidextrous opportunities can create long-term performance, evolve to meet new challenges and take advantage of increasing possibilities, promoting long-term performance and resilience [16]. For instance, Korhonen, et al. [17] advance an abstract concept of ambidextrous usage of AI in a policing context. In police departments, enables the development and research of new

technologies for predictive policing, in which AI algorithms are used to analyze data and make forecasts about possible criminal activities with a view to preventing crimes before they are committed. Additionally, AI could improve contemporary methods of data analysis by enabling processing large volumes of data using the police, thereby increasing efficiency and productivity in both decision-making and resource allocation [17].

Based on the Resource-Based View (RBV), a competitive advantage can be obtained from a firm's resources and capabilities. In the context of GLCs, AI could carry strategic importance in the way of operational efficiency and innovation [18]. This theory seeks to explain the differences between firms that maintain a competitive advantage and those that do not, though it often overlooks variations in performance within individual firms [19]. Essentially, the RBV analyzes the role of a firm's tangible and intangible resources in creating and sustaining competitive advantage [20].

Despite its tremendous potential, AI capabilities are lacking in GLCs, leading to limited ambidextrous opportunities [21]. Therefore, it is important to investigate the role of AI in GLCs so that these companies can leverage AI as ambidextrous opportunities, ultimately supporting their growth and competitiveness in the digital age. The ambidexterity could achieve both innovative initiatives and operational efficiencies to increase GLCs performance [22]. Leveraging AI can increase performance in this competitive market, ensuring they are not left behind in the AI age. While private companies are beginning to adopt AI and experience its benefits, there is a gap in research on AI adoption and its impact on Malaysian GLCs. To date, there are limited studies focused on the adoption and potential impact of AI in GLCs, as previous studies tend to focus on general AI adoption or specific industries without addressing the unique context of GLCs. This study will focus on answering the following research questions (RQs):

RQ1: What is the role of artificial intelligence (AI) that can be leveraged in Malaysian government-linked companies (GLCs)?

RQ2: What is the role of artificial intelligence (AI) in enhancing ambidexterity in Malaysian government-linked companies (GLCs) to improve both existing operations and foster innovation?

Through answering these RQs, this study contributes to the existing literature by filling a gap

in understanding AI adoption and its potential impact on Malaysian GLCs. For policymakers and managers, it offers valuable insights on harnessing AI to enhance competitiveness, productivity, and long-term economic resilience. The research is very useful for giving practical recommendations that enable GLCs to advance their competencies with ambidextrous opportunities of exploration and exploitation toward continuous improvement and competitiveness in the era of digitalization.

**2. METHODOLOGY**

This study conducted a Systematic Literature Review (SLR) following the methodology of Preferred Reporting Items for Systematic Reviews and Meta-Analyses. The SLR process addressed the research questions (RQs) to identify the role of artificial intelligence (AI) that government-linked companies (GLCs) could leverage to enhance ambidextrous opportunities. The PRISMA process is shown in Figure 1.

**2.1 Search Methods**

Artificial intelligence (AI) has been well recognized for its advances and has taken place from the year 2013 [23]. The implementation of AI has significantly increased from 2013 onwards, leading to greater research interest in the field. The role of AI in organizations has become more prominent after 2013 [24].

Therefore, this SLR focused on peer-reviewed journal articles and conference papers published between 2013 and 2024. It was conducted using electronic databases accessible through the authors' university library system. The databases used in this SLR from the university library system were Web of Science (WOS) and Scopus. This study targeted articles about AI implementation in organizations across various sectors.

This SLR fulfilled all of the following inclusive criteria:

- Must include the keywords: Artificial intelligence, government-linked companies, ambidextrous opportunities, digital transformation, adoption, systematic literature review, technology

- Must be written in the English language
- Must be peer-reviewed journal articles and conference papers that discuss about the role of AI
- Must be available from electronic databases accessible through the authors' university library system
- The timeframe of the article from 2013-2024

This SLR excluded all of the following exclusive criteria:

- Written in a language other than English
- The papers written not in the timeframe of 2013-2024
- Not indexed and peer-reviewed in WOS and Scopus databases
- Not included the keywords: Artificial intelligence, government-linked companies, ambidextrous opportunities, digital transformation, adoption, systematic literature review, technology

**2.2 Sample**

A total of 7,065 articles were found in the WOS and Scopus databases. After removing 3,470 duplicate studies, 3,595 articles remained. These 3,595 articles were then filtered, and 1,156 were excluded based on the inclusion and exclusion criteria mentioned above, resulting in 2,439 articles eligible for inclusion. Out of these, some included terms that did not fulfill the criteria of this study. The author then removed the articles that did not focus on the role of AI in GLCs or similar organizations in Malaysia, leaving 48 articles published in peer-reviewed journals eligible for this SLR.

The research categorized these 48 journals based on their areas of focus, which were engineering (n = 5), policy (n = 2), diagnostics (n = 1), energy (n = 2), economics (n = 4), government (n = 2), sustainability (n = 1), public health (n = 1), chemistry (n = 1), human resources (n = 1), science (n = 3), physics (n = 1), complexity (n = 1), artificial intelligence (n = 6), training and development (n = 1), applied economics, finance and accounting (n = 1), management (n = 4), administration (n = 1), technology (n = 7), innovation (n = 1), business (n = 1), and foresight (n = 1). Table 1 provides the list of journals included in this SLR.

Table 1: Database and journals included in systematic literature review

Database	Journal	Frequency
	Engineering Applications of Computational Fluid Mechanics	1

Web of Science (WOS)	Resources Policy	1
	Diagnostics	1
	Mathematical Problems in Engineering	1
	Renewable and Sustainable Energy Reviews	1
	Energy Reports	1
	International Journal of Social Economics	1
	Transforming Government: People, Process and Policy	1
	Sustainability	1
	Frontiers in Public Health	1
	Technological Forecasting and Social Change	1
	18th IEEE International Colloquium on Signal Processing and Applications (CSPA)	1
	TrAC Trends in Analytical Chemistry	1
Scopus	AIP Conference Proceedings	1
	Asia Pacific Journal of Human Resources	1
	Asia-Pacific Social Science Review	1
	Circular Economy	1
	Complexity	1
	Discover Artificial Intelligence	2
	European Journal of Training and Development	1
	Foresight	1
	Government Information Quarterly	1
	IAES International Journal of Artificial Intelligence	1
	International Conference on Computing, Communication, and Intelligent Systems, ICCIS 2023	1
	International Journal of Advanced Science and Technology	1
	International Journal of Applied Economics, Finance and Accounting	1
	International Journal of Data and Network Science	2
	International Journal of Electrical and Computer Engineering	1
	International Journal of Information Management	1
	International Journal of Intelligent Networks	1
	International Journal of Public Administration	1
	International Journal of Sustainable Construction Engineering and Technology	1
	Journal of Advanced Research in Applied Sciences and Engineering Technology	1
Journal of Information Systems Engineering and Management	1	
Journal of Open Innovation: Technology, Market, and Complexity	1	
Journal of Theoretical and Applied Information Technology	1	
Lecture Notes in Networks and Systems	2	
	Management Review Quarterly	1
	Problems and Perspectives in Management	1
	International Conferences on WWW/Internet 2018 and Applied Computing 2018	1
	Research in World Economy	1

Scopus	Review of Applied Socio-Economic Research	1
	Science and Public Policy	1
	Sinergie Italian Journal of Management	1
	Vision The Journal of Business Perspective	1

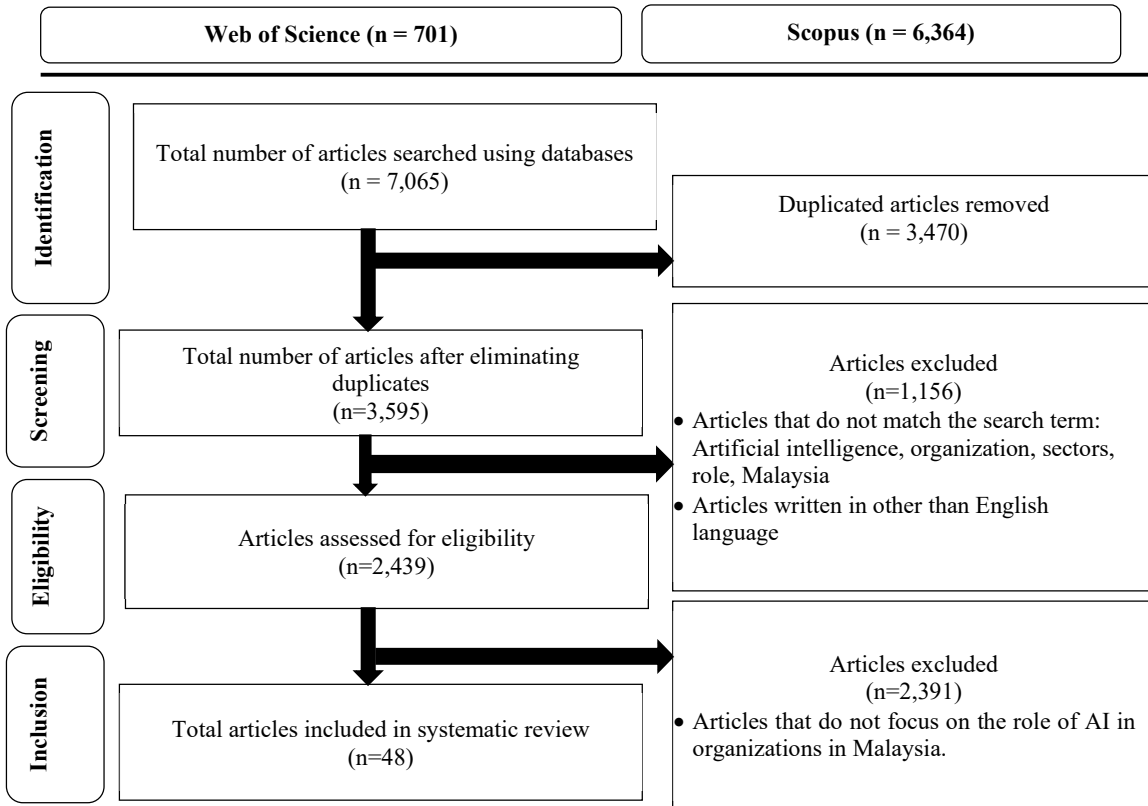


Figure 1: PRISMA flow diagram

### 3. RESULT & DISCUSSION

This section is structured into three parts, each addressing different research questions. The first research question examines how artificial intelligence (AI) can be utilized in Malaysian government-linked companies (GLCs), while the second explores how AI can enhance ambidexterity to improve current operations and drive innovation. Part A discusses the various roles AI can play across different sectors within GLCs, emphasizing its potential to boost productivity and innovation in strategic management, customer interactions, operations optimization, and new revenue generation, directly addressing the first research question. Part B investigates how AI can create ambidextrous opportunities for GLCs by balancing exploration and exploitation, promoting sustained growth and competitiveness, thus addressing the

second research question. Part C provides managerial recommendations for integrating AI across various sectors, predicts the expected outcomes, and highlights the importance of AI in improving competitiveness, operational efficiency, and innovation, offering guidance for policymakers and managers to leverage AI for continuous progress in the digital era.

#### 3.1 Leveraging Artificial Intelligence (AI) in Malaysian Government-Linked Companies (GLCs)

This Systematic Literature Review (SLR) identified the role of artificial intelligence (AI) that could be leveraged in Malaysian government-linked companies (GLCs). The findings represent the role of AI among GLCs in various sectors, such as energy management and construction, natural resource management, healthcare, energy and power,

agriculture, energy and environmental management, e-commerce and business performance, public administration and governance, education, financial services, supply chain and logistics, finance and accounting, marketing, banking and finance, policy governance, management and operations, public service, human resource management, and manufacturing, as shown in Table 2.

GLCs could leverage AI to boost productivity and innovation in every sector, from strategic management and customer interaction to operations optimization and new revenue generation. [25]. Further, it enhances data-driven decision-making and organizational efficiency for strategic planning and operation management, and decision support in strategic planning [26]. Moreover, AI can be applied for organizational performance improvement in process innovation, personal expertise development, and enhancement of organizational structure in general [27]. For example, organizational strategic planning can also be done with the use of AI, but this should be balanced with traditional methods. This emphasizes the important for companies to consider their level of maturity in terms of AI and introduce adaptive policies to make it possible for the company to integrate AI in general [28]. Indeed, AI has an important influence on business success because talent acquisition and development systems, along with performance management, are improved [29]. Besides, AI allows for efficiency in financial and accounting activities to be achieved by savings in time, smooth operations, and the use of advanced technologies to a greater extent [30]. In the procurement and compliance sectors, AI can enhance transparency, accountability, and eliminate corruption in public procurement processes [31]. Additionally, in the economic planning and workforce development sector, AI supports decision-making, streamlining of operations, and a knowledge base to better understand the expected labor market changes and skills needs [32]. Besides that, in the commercial sector, AI may be involved in boosting business functions, problem-solving, and offering up-to-date feedback with customized functions based on customer preferences [33]. In the management and operational sector, GLCs can use AI to effectively develop managerial skills, organizational performance, innovative processes, and readiness for advanced technologies. This could in essence result in cost savings, better competitive

advantages, and improved economic outlook for the country [34]. Similarly, AI help guarantee enhanced agility, flexibility, and resilience in face of economic alterations [35].

On the other hand, GLCs may optimize the use of AI in the human resource management sector to help in augmenting capabilities in employee development, recruitment, training and overall HR skills [36]. In turn, this will drive the enhancement of better HR planning, employee retention, recruitment processes, and overall HR efficiency for organizations [37]. Additionally, AI can be applied to GLCs to enhance human resource training in some development and workforce skills, developing careers, and realizing competitive workforce sustainability [38]. Furthermore, AI could enhance corporate readiness as well as perceptual gain and technological readiness, ultimately improving the effectiveness of the HR system [39]. It could also reinforce HR capabilities, increase employee satisfaction levels, and support more sophisticated, data-based, predictive employee retention strategies, enhance recruitment, talent management, HR operations, learning and development, reporting, analytics, and self-service support [40, 41].

AI can be used to predict cooling loads in residential buildings for the energy management and construction sectors by GLCs, thereby improving energy efficiency. AI is also utilized for optimizing energy consumption and designing energy-efficient buildings [42]. In the natural resource management sector, AI can significantly influence policy-making, decision-making, and sustainable resource use [43]. Additionally, AI can be deployed within the e-commerce divisions of GLCs to optimize digital strategies and enhance competitive positioning in the market [44].

In the management of energy and the environment, AI can be utilized by GLCs for better use of renewable energy and to help achieve the United Nations SDGs for sustainable development [45]. Moreover, AI can further be adapted to the learning sector of GLCs in order to improve teaching practices, enhance access to education, and infuse intelligent learning and social robots into the system [46]. Additionally, AI in the financial service sector of GLCs can further be utilized in automated investment management services, customer



engagement, and services' automation that boosts robo-advisor acceptance, as well as covering perceived risks through security measures and strategic endorsements [47, 48]. Moreover, it will drive efficiency and create operational improvements in the form of automation, which reduces costs and enhances decision-support services to make manual work on dull, time-consuming activities [49].

Within the supply chain and logistics industry, GLCs could use AI for better resource optimization, enhance the overall decision-making process, and address security and system complexity issues to increase speed and efficiency in operations, among others [50]. Further, the adoption of AI technology in the marketing space can potentially provide a way forward to increase effectiveness while moving towards digital marketing strategies within the GLCs, enhance user engagement, improve resource allocation, and support data-driven decision-making [51].

More importantly, AI could be used within the public service sector in GLCs to drive citizen satisfaction through better procedural justice and higher private value creation and, consequently, toward greater perceived usefulness and enjoyment of public services [52]. Equally, the GLCs could maximize AI in that sector to manage the risk posed and underpin the regulatory frame in a more resilient manner such that the challenges and opportunities of the AI technology sectors like politics, economy, and culture are tackled, as expressed [53].

In the healthcare sector, GLCs could leverage AI in various ways. In this regard, the transformational power of AI, especially ChatGPT, in healthcare cannot be overlooked. AI can improve patient care, support medical professionals, enhance pandemic control, and facilitate medical education and research [54]. Most importantly, it can be used for earlier cancer detection, better targeting for treatment personalization, and commercializing the new innovative diagnostics technologies [55]. AI can also improve emergency management, the maintenance of patients' records, diagnostics, and the overall delivery of health, while it resolves issues related to trust, security, privacy, and precision in care provision [56].

Additionally, AI can be applied by GLCs for those in the energy and power segment. The energy sector is one of the primary focuses for AI application, particularly in system control and automation to the development of future policies regarding sustainability and efficiency in the use of energy in GLCs across Malaysia [57]. Furthermore, this will enhance the accuracy of electric load demand forecasting, resulting in high operation efficiencies and low costs in smart grid management [58].

Through AI, the GLCs in the agriculture industry could perform smart farming for the revamping of agriculture, enhancement of productivity, and optimization of economic results [59]. All these are potential through a better-optimized technique of smart farming brought about by the acquisition of AI. These can facilitate enhanced decision-making and those issues relating to food scarcity and sustainable growth, efficiency in rice production, secured food supplies, and better livelihoods of the farmers [60, 61]. In the agriculture sector of GLCs, AI has an application to the precision agriculture approach for improved crop management, better resource use efficiency, and sustainable farming practices [62]. AI may further be extended to the monitoring of soil and crops, managing diseases, and productivity in order to manage soil and crops for overall productivity in a better way, which makes the practice of farming more sustainable and efficient [63].

Furthermore, GLCs could leverage AI in the public administration and governance sector to enhance administrative efficiencies, improve governance practices, and test new AI-based structures and applications [64]. In the public administration sector, AI could improve citizen services, enhance operational efficiency, streamline interactions through chatbot adoption, enhance decision-making processes, and support the adoption of data intelligence and analytics [65, 66]. It can also be used to further enhance the productivity and quality of service in GLCs' public administration sector by addressing AI adoption issues toward realizing inclusive development and creating new opportunities for management alignment, cultural integration, infrastructure development, data management, and ethical governance [67].

AI in banking and finance will enable the GLCs to provide security, operational efficiency, create confidence among consumers, innovate with new financial products and services, and above all improve customer segmentation, credit risk analysis, fraud detection, and business intelligence [68, 69]. Besides that, AI can improve quality services by applying ChatGPT on performance expectancy and technology readiness increasing the possibility to adopt new systems and remain competitive in marketplace [70].

GLCs could leverage AI in the manufacturing sector. New product development and innovation would be enhanced by AI, which, in the long run is going to result in higher product success and increased companies' growth [71]. It could further advance the cause by seeking support in operational efficiency, innovation, and competitive advantage from AI, with a sharp emphasis on top management and government support [72].

### **3.2 The Role of Artificial Intelligence (AI) In Providing Ambidextrous Opportunities in Malaysian Government-Linked Companies (GLCs)**

The Systematic Literature Review (SLR) was carried out to identify the possible roles and opportunities for artificial intelligence (AI) that the government-linked companies (GLCs) can leverage within its sectors. The results show that AI serves as a powerhouse that drives productivity and innovation while leading GLCs to high levels of both. This SLR proposes managerial recommendations which GLCs can use to create ambidextrous opportunities balancing exploration and exploitation for sustained growth and competitiveness as shown in Table 3.

The integration of AI analytics tools into decision-making by strategic management and innovation will strengthen the processes of decision-making and open up ambidextrous opportunities among GLCs to have real actionable and predictive intelligence for strategic decisions [73]. Use of such tools may result in overall organizational efficiency leading to improved strategic planning and operational management, which has been suggested as a use case in striking balance between exploration and exploitation activities [26]. With the backing of AI-based analytics, GLCs would capitalize on

insights from the market, customers, and performance operations in ways that could empower the making of smart, data-driven decisions for strategic and operational impact. Besides, fostering process innovation through strategic management and innovation is necessary to cultivate a culture of constant improvement and adaptability. The embedding of AI in process management systems allows for the detection and correction of inefficiencies, thereby supporting continuous innovation through the process [74]. In an AI-driven optimized process, not just an increase in productivity is observed but also a culture where creativity and innovations are enhanced. This dual approach supports ambidexterity where GLCs will be able to explore new opportunities but yet improve their existing processes to ensure they stay competitive in dynamic markets [27].

GLCs should automate routine financial jobs, such as invoicing, expense tracking, and financial reporting, to bring up operational efficiency with AI-enabled accounting software [75]. This would lead to a reduction in costs and an increase in details in parts tracking, thereby resulting in precise financial decision-making for the organization to balance exploratory and exploitative activities [30]. It is important to add more transparency to the procurement processes. The AI software should monitor all transactions, requisitions, and purchases made within the procurement system for compliance and efficiency [76]. This will effectively raise the aspect of transparency, accountability, and bring down corruption. Thus, it will boost overall operational efficiency and breed an ambidexterity-friendly organizational atmosphere [31].

Another major area, in this context, involves creating ambidextrous opportunities for the GLCs by optimizing supply chain resources through AI. In this AI is to be used in logistics and any other supply chain applications to help GLCs in better decision-making and handling security issues, besides improving operational efficiency [77]. Through AI, huge data caches can be processed to predict demands, control stocks, and improve routings, eventually allowing a degree of efficiency and effectiveness that greatly improves supply chains. Both exploiting the current methods and exploring new supply chain solutions ensure the balance of this



duo, which is meant for sustained competitiveness [50].

AI can be very useful in governance and public service, greatly improving the efficiency of operations and satisfaction among citizens. Some of its most important applications are the use of AI chatbots in public administration for public inquiries and the application of AI data analytics in policy-making [78]. This can help further better citizen service, quicker operations, and support for data-driven governance [65]. In addition, enhanced policy governance by introducing AI models for assessing the impacts of policies and facilitating regulatory compliance for dealing with risks and increasing regulatory frameworks [79]. Such an approach will ensure that GLCs would be able to strike a fair balance between a policy development need-driven innovation exercise and effective provision for regulatory oversight to underpin the ambidextrous opportunity [53].

The GLCs are made fit for financial services through the use of AI-driven financial advisory and customer service platforms. This enhances automated investment management using AI and improves customer engagement with the adoption of robo-advisors [47, 48, 80]. This will help improve service delivery while allowing for properly executed maintenance and customer personalization using new services. AI can be used in the domains of customer segmentation and targeted marketing and can drive digital marketing strategies more effectively in marketing. AI-enabled resource allocation and campaign optimization should be able to help GLCs get better outputs and wider customer engagement through ambidexterity [51, 73]. This will enable the GLCs to be ambidextrous, to be innovative with new marketing approaches and, concurrently, make optimum use of those strategies proved in research.

Enhancement of human resource management is another major factor that will enable such ambidextrous opportunities in GLCs. AI-based HR platforms will consequently increase HR efficiencies within the GLCs to hire, train, and manage performance for employee development and retention [36, 81]. These are the AI tools that shall convert any human resource function into a more effective and responsive activity pertaining to the

needs of an organization and its employees. Moreover, it even doubles the corporate readiness through amplified corporate readiness, heightened perceptual gains, and greater technological readiness by utilizing AI tools to track the performance of employees to facilitate growth in their career path [39, 82]. The dual enhancement of HR function, in the present condition and preparing the firm for future challenges helps to create ambidexterity as the two critical elements are balanced, short-term needs with long-term strategic aims.

It is also key that AI is responsible for managing energy; therefore, optimizing energy management is necessary to achieve ambidextrous opportunities. AI-enabled smarter energy management at residential and commercial buildings can automate control and monitor cost-saving measures to increase energy efficiency and minimize operational costs [42, 83]. Additionally, AI can help in real-time climate and resource monitoring, optimize land management for cattle and humans so that policymakers and scientists have more data available for decision-making and better resource management for sustainable use and preservation [43, 84].

The use of AI in diagnostic tools, patient management systems, and medical research platforms can enhance patient care, aid healthcare providers in their practice, and contribute to the advancement of medical research [54, 85]. AI is revolutionizing health care, with the means to detect disease early, diagnose disease, predict outcomes, and personalize treatment across numerous diseases, whether they are of the oncological, neurological, or cardiological type [86]. Moreover, AI may help clinicians make diagnostic and predictive decisions, and utilize personalized medicine approaches [87].

In agriculture, AI can increase the productivity of farmers, optimize resource utilization, and accomplish all the sustainable objectives through AI-deployed sensors and drones for precision farming and crop monitoring [59, 88]. In the same manner, the use of AI in the customer relationship management (CRM) and digital marketing platform can improve digital strategies for competitive positioning and engaging more customers, respectively, while also impacting e-commerce strategies that favor the GLCs [44, 89].

Increased use of renewable energy, supporting energy and environmental sustainability, can only benefit GLCs if AI is deployed in green energy projects to help in better resource conservation [90]. The other development that AI can bring is achievement in sustainable development goals (SDG) and driving sustainable solutions [45] with AI-based improvement in the management of smart grids. This will involve AI predictions for managing energy-distribution optimization loads to help in the increment of operational efficiency and reduction of cost associated with the same respect [58, 91]. These challenges can be addressed by the application of AI in the management of the smart grid, enabling it to predict loads and manage the optimization of energy distribution. The measures complement ambidextrous opportunities of GLCs to pilot new solutions to energy while making an efficient use of resources.

Ambidextrous opportunities are brought to achievement levels by increasing the agility of the organization. The use of AI for the GLCs to simulate economic scenarios and develop strategic responses in enhancing further in agility, flexibility, and resilience in managing economic dynamics is suggested as an opportunity [35, 92]. Moreover, the building up of managerial competencies with the help of AI algorithms that facilitate managerial training and innovation workshops will support the innovative process, cost reduction, and readiness toward advanced technologies [34, 93]. Such practices focusing on the improvement of current management practices and preparing for challenges in the future foster ambidextrous opportunities and balance the tensions between immediate operational needs and long-term strategic development.

As we gain more opportunities to be ambidextrous in manufacturing, resources and desires will turn to product development enhancement [94]. A greater success rate in product innovation with AI indicates increased growth in GLCs [95], where the AI can be targeted toward fast and effective product development that is capable of solving the needs in the market. AI solutions in operational research further play facilitating roles, such as optimized solutions for smart factories with integrated AI capabilities to enhance the production processes [96]. In manufacturing, the capacity of AI

in automation of the production process and reduction of waste while increasing product quality holds the potential to be a game-changer in terms of operating efficiencies, innovation, and competitive advantage [72]. This two-prong approach to develop existing methods together with the exploration of uncharted production territories allows ambidextrous options and balances immediate operational needs with future-proof developmental strategies.

Based on the literature reviewed until now, this study posits that the application of AI might enable Malaysian GLCs to develop ambidextrous capabilities to create opportunities for both innovation and operational efficiency that boost their competitive position and relate positively to the growth and viability of the economy.

### 3.3 Practical/Managerial Implications

Table 3 delineates the significance of artificial intelligence (AI) in various sectors, providing managerial recommendations for its integration, and predicting the anticipated results. Within the context of strategic management and innovation, AI bolsters decision-making capacities [26] through integrated analytics tools, facilitating improved strategic planning and operational effectiveness [26, 73]. Moreover, the integration of AI in process management fosters a continuous cycle of innovation and productivity enhancements, cultivating an environment conducive to innovation [27, 74].

In financial and operational efficiency, AI-powered accounting software automates financial operations, thereby improving efficiency and decision-making processes [30, 75]. Furthermore, AI enhances transparency and minimizes corruption in procurement procedures by consistently monitoring transactions [31, 76].

Regarding managerial and operational flexibility, AI increases the organization's flexibility and further develops managerial competencies within the organizational unit [34, 35, 92, 93]. Besides, AI enhances manufacturing through refining product innovation as well as operational effectiveness [71, 72, 95, 96].

Table 3 also contains a variety of sector-specific applications, which cut across from optimizing supply chain resources using AI [50, 77], to enhancing public administration through AI chatbots and data analytics [65, 78], and reinforcing policy governance through the use of AI models [53, 79]. In finance and marketing, investment management and customer interaction are enhanced by AI, and in the process, it maximizes efforts in marketing through the segmentation of customers in financial services and marketing [47, 48, 51, 73, 80].

In HR and organizational capacities, AI-driven platforms streamline HR effectiveness and corporate readiness [36, 39, 81, 82]. AI also streamlines energy administration [42, 83], advocates for sustainable natural resource management [43, 84], and transforms healthcare via sophisticated diagnostic mechanisms and patient management frameworks [54, 85-87].

In agriculture, AI sustains intelligent farming practices [59, 88], whereas in e-commerce, it enriches the management of customers' relationships and digital marketing strategies [44, 89]. Lastly, under energy and environmental sustainability, AI maximizes the use of renewable energy and the management of smart grid systems [45, 58, 90, 91]. All these roles and recommendations for AI are efforts to create ambidextrous opportunities for the government-linked companies (GLCs) that would synchronously align exploration and exploitation for sustainable growth and competitiveness.

Overall, the application of AI-based analytics tools in GLC management will improve the efficacy of strategic decision-making and operational efficiency through quick actionable and predictive intelligence [73]. The incorporation of process management systems with AI could then lead to the detection and remediation of inefficiency while fueling constant innovation [74]. Besides that, it helps in increasing efficiency and accuracy in invoicing, tracking expenses, and reporting finances by deploying AI accounting software [75].

AI can be used by the managers of GLCs as a tool to monitor, for both efficiency and compliance, all the procurement transactions [76]. Moreover, the usage of AI can apply in logistics to optimize the application of supply chain in GLCs [77]. In addressing public inquiries as well as policy formulation, AI chatbots and data analytics will be instruments of enrichment [78], while AI models that are shared in evaluation can be utilized for impacts on policies and regulatory compliance [79]. AI-driven advisory and customer service platforms will help ramp up engagement and service automation in financial services [80].

In the marketing domain, GLCs' managers will be able to utilize AI tools for customer segmentation and directed efforts [73]. AI-enabled HR platforms make hiring, training, and performance management easier [81], as AI tools themselves can monitor the performance and career development of an employee [82]. In the energy sector, GLCs managers may optimize energy management within the buildings and support green energy projects using AI [83, 90]. For real-time monitoring of the natural resources, they could also utilize AI to assist in the sustainable management [84].

In healthcare, managers within GLCs could apply AI in diagnostic tools, patient management, and medical research [85]. For agriculture, GLC managers can deploy AI sensors and drones to ensure precision farming [88]. Finally, CRM and digital marketing platforms in GLCs could be run through AI toward improvements in strategy in customer engagement [89], (Wan et al., 2021; Zhang et al., 2021), even using AI for smart grids in load forecasting and optimization in energy distribution for better efficiency [91]. AI may also simulate economic scenarios for strategic answers and boost managerial training and innovation workshops [92, 93]. AI implementation in product innovation and development as well as in smart factory optimized solutions manufacturing can be utilized by GLCs managers in the manufacturing sector.

Table 2: The Role of Artificial Intelligence (AI)

No	Author (Year)	Sectors/Operations	The Role of Artificial Intelligence (AI)
1	Zheng, et al. [42]	Energy Management and Construction	Optimize energy consumption and improve the design of energy-efficient buildings.
2	Pandey, et al. [43]	Natural Resource Management	Enhance decision-making, optimize resource use, and create strategies for sustainable management.
3	Younis, et al. [54]	Healthcare	Enhance patient care, support medical professionals, improve pandemic management, and facilitate medical education and research.
4	Singh, et al. [55]		To improve early cancer detection, personalize treatment, and facilitate the commercialization of innovative diagnostic technologies
5	Akhtar, et al. [56]		Improve emergency management, patient record maintenance, diagnostics, and overall healthcare service delivery
6	Islam and Ahmed [58]	Energy and Power	Enhance electric load demand forecasting accuracy
7	Danish and Senjyu [57]		enhance system operations, control, automation, and policy development for a sustainable and efficient energy future.
8	Huo, et al. [61]	Agricultural	Enhance smart farming methods, refine decision-making processes, and tackle issues related to food shortages and sustainable development.
9	Javaid, et al. [62]		Implement precision agriculture, improve crop management, enhance resource utilization, and support sustainable farming practices
10	Rodzalan, et al. [59]		Essential for implementing smart farming to revitalize agriculture, enhance productivity, and optimize economic outcomes.
11	Sarkar, et al. [63]		Enhance soil management, crop monitoring, disease management, and overall productivity, promoting sustainable and efficient farming practices
12	Zaman, et al. [60]		Promote smart farming practices, improve rice production efficiency, ensure food security, and enhance the well-being of farmers
13	Hannan, et al. [45]	Energy and Environmental Management	Optimize renewable energy utilization and support the attainment of sustainable development goals.
14	Fonseka, et al. [44]	E-commerce	Optimize digital strategies and enhance competitive positioning in the market
15	Jais and Ngah [66]	Public Administration and Governance	Improve citizen services, enhance operational efficiency, and streamline interactions through chatbot adoption
16	Di Vaio, et al. [65]		Enhance decision-making processes, improve efficiency, and support the adoption of data intelligence and analytics
17	Alshahrani, et al. [67]		Improve productivity, service delivery, address the AI adoption issues

18	Wirtz, et al. [64]		Uplift administrative efficiencies, improve governance practices, and test new AI-based structures and applications.
19	Ahmad, et al. [46]	Education	Enhance teaching methods, improve access to education, and implement intelligent learning systems and social robots.
20	Al-Gasawneh, et al. [47]	Financial Services	Enhance investment management, improve service automation, and address perceived risks through security measures and strategic endorsements
21	Zheng, et al. [48]		Enhance automated investment management services, improve customer engagement, and drive the adoption of robo-advisors.
22	Khaled AlKoheji and Al-Sartawi [49]		Boost operational efficiency, lower costs, and support decision-making, to transform repetitive and time-intensive manual processes.
23	Isnin, et al. [50]	Supply Chain and Logistics	Optimize resources, facilitate better decision-making, and resolve security and system complexity challenges leading to faster and more efficient operations
24	Rahim, et al. [51]	Marketing	Increase the effectiveness of digital marketing strategies, increase user engagement, improve resource allocation, and support data-driven decision-making.
25	Bouteraa, et al. [70]	Banking and Financial	Increase service quality by using ChatGPT, improve performance expectancy, enhance technology readiness by enabling the adoption of new systems and staying competitive in the market.
26	Kalyani and Gupta [68]		Offer security, drive operational efficiency, create consumer confidence, and innovate financial products and services.
27	Raúl, et al. [69]		Improve customer segmentation, credit risk analysis, fraud detection, and business intelligence.
28	Wang, et al. [52]	Public Service	Drive citizen satisfaction through better procedural justice and higher public value creation.
29	Yee and You [53]		Manage risk, strengthen regulatory frameworks, ensuring the challenges and opportunities from the AI technology disrupting sectors.
30	Jianjun, et al. [71]	Manufacturing	Enhance new product development and innovation
31	Ghani, et al. [72]		Improve its operational efficiency, innovation, and competitive advantage with a strong focus on top management and government support.
32	Abonamah and Abdelhamid [25]	Various operations/sectors	Improve productivity and innovation of strategic management, customer interactions, operations optimization, and new revenue generation.

33	Adobor and Yawson [31]	Enhance transparency, accountability, and also eliminate corruption in public procurement.
34	Usmani, et al. [26]	Enhance data-driven decision-making and organizational efficiency.
35	Sharif Ismail and Muhammad [27]	Improve the overall organizational performance
36	Ghosh, et al. [32]	Assist in decision-making, streamline operations, and build a knowledge base on the anticipated labor market impacts and skills requirements from AI adoption.
37	Costa, et al. [33]	Improve business functions, problem-solving, as well as to provide a real-time response and customized function based on customers' preferences
38	Muala, et al. [28]	Enhance organizational strategic planning
39	Xin, et al. [29]	Influence on business success.
40	Rawashdeh, et al. [30]	enhance their efficiency, save time, and increase the adoption of advanced technologies in financial and accounting operations.
41	Odeibat [34]	Develop managerial skills, enhance organizational performance, support innovative processes, and provide readiness for advanced technologies.
42	Ciampi, et al. [35]	Increased agility, flexibility, and resilience when faced with economic changes
43	Laviola, et al. [36]	Improve capabilities of employee development, recruitment, training, and overall HR skills.
44	Siradhana and Arora [37]	Enhance HR planning, employee retention, recruitment processes, and overall HR efficiency.
45	Hamouche, et al. [38]	Strengthen employee skills training, career development, and create a more sustainable, competitive workforce.



46	Agarwal [39]	Various operations/sectors	Enhance corporate readiness, perceptual gains, and technological readiness.
47	Zhang and Jamil [40]		Improve HR functionalities, increase employee satisfaction rates, and allow advanced data-driven and predictive employee retention strategies.
48	Sithambaram and Tajudeen [41]		Improve recruitment, talent management, HR operations, learning and development, reporting, analytics, and ultimately, self-service assistance.

Table 3: The Role of Artificial Intelligence (AI) In Providing Ambidextrous Opportunities in Malaysian Government-Linked Companies (GLCs)

Sectors	The Role of Artificial Intelligence	Managerial Recommendation	Expected Outcome
Strategic Management and Innovation	enhance decision-making capabilities [26].	AI-based analytics tools need to be integrated to get immediate actionable and predictive intelligence to make strategic decisions [73].	This will enable better strategic planning, operational management, and improve organizational efficiency [26].
	promote process innovation [27].	Embed AI into process management systems to detect and remediate inefficiencies while enabling ongoing innovation [74].	AI-driven process improvements can enhance productivity and create a culture of innovation [27].
Financial and Operational Efficiency	automate financial tasks [30]	Deploy AI-driven accounting software for tasks such as invoicing, expense tracking, and financial reporting [75].	This will boost efficiency, reduce costs, and support more accurate financial decision-making [30].
	enhance transparency in procurement [31].	AI software should constantly monitor all requisition and purchase transactions from an outside vendor for compliance and efficiency via the procurement system [76].	AI can enhance transparency, accountability, and reduce corruption in procurement processes [31].
Supply Chain and Logistics	optimize supply chain resources [50]	Deploy AI logistics and other AI supply chain applications [77].	AI can facilitate better decision-making, resolve security challenges, and improve operational efficiency [50].
Public Services and Governance	improve public administration [65]	Use AI chatbots for public inquiries and AI data analytics for policy-making [78].	AI can enhance citizen services, operational efficiency, and data-driven governance [65].
	strengthen policy governance [53]	Creating AI models to evaluate policy impacts and facilitate regulatory compliance [79].	AI can help manage risks and strengthen regulatory frameworks in various sectors [53].
Financial Services and Marketing	automate financial services [47, 48]	Deploy financial advisory and customer service platforms powered by AI [80].	AI can provide automated investment management, enhance customer engagement, and increase the adoption of robo-advisors [47, 48]
	optimize marketing efforts [51].	Use AI in customer segmentation and targeted marketing efforts [73].	AI can increase the effectiveness of digital marketing strategies and improve resource allocation [51].
HR and Organizational Capabilities	enhance human resource	Employ AI-powered HR platforms for hiring, training, and performance management [81].	AI can improve HR efficiency, employee development, and retention [36].

	management [36]		
	boost corporate readiness [39]	Use AI tools to monitor employee performance and for career growth [82].	AI can enhance corporate readiness, perceptual gains, and technological readiness [39].
Energy and Environmental Sustainability	optimize renewable energy utilization [45]	Include AI in green energy projects for effective management of resources [90].	AI can support the attainment of sustainable development goals (SDGs) and promote environmental sustainability [45].
	enhance smart grid management [58]	Load forecasting and energy distribution optimization on smart grid systems using AI [91].	AI can improve operational efficiency and reduce costs in energy management [58].
Management and Operational Flexibility	increase organizational agility [35]	Simulate economic scenarios and develop strategic responses using AI [92].	AI can enhance agility, flexibility, and resilience in response to economic changes [35].
	develop managerial skills [34]	Algorithms emerging as augmentation of managerial training and innovation workshops [93].	AI can support innovative processes, cost reduction, and readiness for advanced technologies [34].
Manufacturing Innovation	enhance product development [71]	Use AI in product innovation and development [95].	AI can lead to greater product success and organizational growth [71].
	improve manufacturing efficiency [72]	Manufacture optimized smart factory solutions with AI capabilities [96].	AI can improve operational efficiency, innovation, and competitive advantage [72].
Sector-Specific Applications	optimize energy management [42]	Use AI for smarter energy in residential and commercial buildings and automate control and monitor money-saving opportunities in energy management systems [83].	This will enhance energy efficiency and reduce operational costs [42]
	sustainable natural resource management [43]	Measure and monitor natural resources in real time, using AI to determine the true cost of resources; for use as an input for new policies and decisions—utilizing AI for better management of natural resources [84].	AI can promote sustainable resource use and support environmental conservation efforts [43].
	revolutionize healthcare [54]	Implement AI in diagnostic tools, patient management systems, and medical research platforms [85].	AI can improve patient care, support medical professionals, and facilitate advanced medical research [54].
			AI is revolutionizing healthcare by enhancing early detection, diagnosis, treatment, and outcome prediction in various diseases, including cancer, neurology, and cardiology [86].
			AI can support physicians in diagnosis, disease prediction, and treatment customization [87].
	implement smart farming [59]	Precision farming and crop monitoring through AI-deployed sensors and drones [88].	AI can enhance productivity, optimize resource use, and support sustainable agricultural practices [59].
enhance e-commerce strategies [44]	Incorporate AI into customer relationship management (CRM) and digital marketing platforms [89].	AI can optimize digital strategies, enhance competitive positioning, and increase customer engagement [44].	

#### 4. LIMITATIONS

In terms of limitations, this systematic literature review (SLR) is constrained by the PRISMA methodology used to search for articles. The search was conducted electronically using only the available sources of the authors' university library system, which are WoS and Scopus. Still, another limitation is that this study is narrowed to peer-reviewed articles written in the English language only with the specific date of publication from 2013-2024. Lastly, generalizability and scope were at its limit since this study focused only on the articulation of artificial intelligence (AI) that can be adapted by Malaysian government-linked companies (GLCs).

#### 5. CONCLUSION

Government-linked companies (GLCs) could be identified as those firms with significant government ownership that have remarkably contributed to the economic growth of Malaysia. Today, in this digital market, GLCs should consider adopting current technology within the digital domain in order to improve their performance and compete at the same level as non-GLCs. One main digital technology is artificial intelligence (AI), which hugely enhances performance in this competitive market.

However, there is still a lack of using AI in GLCs. This may be a reason for lagging in this competitive market. Therefore, this study would like to understand the role of AI in enhancing the ambidextrous opportunities among Malaysian GLCs for their growth and competitiveness in the digital era. This paper has identified the role of AI that can be leveraged by GLCs to enhance ambidextrous opportunities through the SLR. The current paper contributes to filling such a gap as the scant work available on the adoption and impact of AI in Malaysian GLCs tends to be either focused on general AI adoption or in certain industries without addressing the unique context of GLCs.

Derived from the findings, the research has identified a number of functions for AI, such as automation of financial processes, ensuring transparency in procurement, optimization of supply

chains' resources, betterment in public administration, enhancement in policy governance, automation of financial services, optimization of marketing endeavors, perfection of human resource management, increase in corporate readiness, energy management, sustainable natural resources management, revolutionizing healthcare, implementation of smart farming, e-commerce strategies, optimization of renewable energy utilization, smart grid management, increase in organizational agility, development of managerial skills, product development, and improvement in manufacturing efficiency. These roles of AI are recommended in this study for implementation in the specific sectors of GLCs to enhance their ambidextrous opportunities.

Moreover, this study provided managerial recommendations for implementing AI in various sectors of GLCs, which can significantly boost their competitiveness and ensure sustained growth in the digital age. GLC managers could integrate AI-based analytics, embed AI in process management, deploy AI-driven accounting software, utilize AI for monitoring procurement and optimizing logistics, enhance public inquiries and policy-making with AI chatbots, improve financial services with AI advisory platforms, use AI for marketing customer segmentation, streamline HR functions with AI-powered platforms, optimize energy management, employ AI for sustainable resource management, implement AI in healthcare diagnostics, enhance precision farming with AI sensors and drones, improve CRM and digital marketing strategies, optimize smart grids, simulate economic scenarios for strategic responses, and drive product innovation and smart factory solutions in manufacturing. Future studies could focus on the issues and challenges that may arise from leveraging AI in GLCs.

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