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The Importance of Artificial Intelligence on Strategic and Operational Decision-Making: Bibliometric Review

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BUSINESS
SCHOOL

Department of Strategy, Marketing, Operations and General Management

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This research marks the culmination of a pivotal chapter in my academic journey, symbolizing the successful attainment of my master's degree.

In light of this significant achievement, I extend my heartfelt gratitude to those individuals who have not only imparted valuable knowledge but have also served as beacons of inspiration, guiding me on the path of persistence.

My warmest thanks to my supervisor, Renato Lopes da Costa, and my co-supervisor, Angelo Pereira, who made this work possible. Their guidance and advice were invaluable throughout all stages of writing my project.

To my family and friends.

I'll also express my eternal gratitude to my fiancée, who supported me from the beginning.

RESUMO

Este estudo explora o papel e o impacto da Inteligência Artificial (IA) nos processos de tomada de decisão estratégica e operacional por meio de uma análise bibliométrica utilizando o banco de dados Elsevier Scopus e Vos Viewer, para visualizar as informações fornecidas pelo banco de dados. A investigação destaca o aumento de publicações académicas, indicativo de um crescente interesse académico na convergência da Inteligência Artificial com a estratégia e a tomada de decisões operacionais. Através de uma síntese abrangente da literatura existente, o estudo oferece informações valiosas para pesquisadores e partes interessadas. Com a análise de tendências recentes, artigos influentes e temas emergentes, esta pesquisa serve como um guia para compreender o panorama do impacto da IA na tomada de decisões estratégicas e operacionais.

Palavras-chave: Inteligência Artificial, Tomada de Decisão, Estratégia, Operações, Análise Bibliométrica.

Classificação JEL:

O32 - Gestão da Inovação Tecnológica e I&D.

O33 - Mudança Tecnológica: Escolhas e Consequências • Processos de Difusão.

ABSTRACT

This study explores the role and impact of Artificial Intelligence (AI) on strategic and operational decision-making processes through a bibliometric analysis utilizing the database, Elsevier Scopus, and Vos Viewer, to visualize the information provided by the database. The research highlights the surge in academic publications, indicative of an expanding scholarly interest in the convergence of Artificial Intelligence with strategy and operational decision-making. Through a comprehensive synthesis of existing literature, the study offers valuable insights for researchers and stakeholders. With the analysis of recent trends, influential articles, and emerging themes, this research serves as a guide for understanding the landscape of AI's impact on strategic and operational decision-making.

Keywords: Artificial Intelligence, Decision-Making, Strategy, Operations, Bibliometric Analysis.

JEL Classification:

O32 - Management of Technological Innovation and R&D.

O33 - Technological Change: Choices and Consequences • Diffusion Processes.

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INDEX OF ACRONYMS

AI - Artificial Intelligence

BI - Business Intelligence

BPM - Business Process Management

COVID-19 - Coronavirus Disease 2019

CRM - Customer Relationship Management

DSS - Decision Support Systems

ERP - Enterprise Resource Planning

HRM - Human Resource Management

ICT - Information and Communication Technology

IoT - Internet of Things

KPI - Key Performance Indicator

ML - Machine Learning

M&A - Mergers and Acquisitions

NLP - Natural Language Processing

PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses

R&D - Research and Development

SCM - Supply Chain Management

SLR - Systematic Literature Review

SME - Small and Medium-sized Enterprises

SWOT - Strengths, Weaknesses, Opportunities, Threats

VOS - Visualization of Similarities

CHAPTER 1
INTRODUCTION

AI has rapidly transformed from a concept to a critical tool driving innovation across industries. In the context of operational and strategic decision-making, AI has shown its potential to enhance business processes, optimize resource allocation, and support decision-making.

This master's thesis seeks to investigate the impact of AI from 2015 to 2024, with a particular focus on how AI is being integrated into business strategies and operations, and what challenges and opportunities they present. The literature review forms the backbone of this study, providing insights into key trends, geographical distribution of AI research, and common themes. It references several recent studies that highlight the varied applications of AI across sectors like sustainability, banking, supply chains, commerce, energy, etc. For example, studies by Ghandour in banking and Oger et al. in supply chain management showcase the potential benefits of AI, such as improved fraud detection and enhanced efficiency, respectively. These references are a few examples for understanding the broad impact of AI, while also shedding light on significant challenges, including data privacy, ethical considerations, and system integration.

The primary objective of this thesis is to explore how AI is influencing strategic and operational decision-making. The research question that underlies this objective is: How has AI impacted strategic and operational decision-making?

To address this objective, the thesis is structured as follows: Chapter 1 introduces the topic and outlines the scope of the study, detailing the significance of AI in operational and strategic decision-making. Also referring to the objective of this thesis investigation and the underlined research questions.

In Chapter 2, it will be explored the theoretical foundations of artificial intelligence (AI) in strategic and operational decision-making. The literature review provides a historical overview of AI's evolution, tracing its roots from early rule-based systems to contemporary machine learning and deep learning applications. This chapter discusses how these advancements have transformed decision-making across various industries.

Chapter 3 covers the methodology used in this research, details the research questions, data criteria, and the process of article selection and screening. The rigorous approach to data

collection ensures that the study is based on a comprehensive and reliable dataset, drawing from the database Scopus.

Chapter 4 presents the bibliometric analysis, offering a quantitative examination of the research landscape. This chapter delves into the top publishing sources, total publications by subject area, geographic distribution, document types, and keywords selection. A keyword co-occurrence map is included to visually represent the connections between various AI-related concepts. This analysis provides a broader context for understanding the trends in AI research and the interdisciplinary nature of the field.

Chapter 5 discusses the research question by exploring the main findings from the literature review and bibliometric analysis, focusing on the benefits of AI in strategic and operational decision-making, as well as the challenges and barriers to AI adoption. The chapter proposes solutions to mitigate these issues, supported by case studies and examples from various industries.

The conclusion summarizes the key findings and offers recommendations for future investigators and organizations seeking to integrate AI into their business strategies, emphasizing the importance of addressing ethical concerns, data privacy, and comprehensive training to ensure successful AI adoption. The conclusion also suggests areas for future research, highlighting the ongoing evolution of AI and its role in decision-making.

CHAPTER 2
THEORETICAL BACKGROUND

A literature review involves exploring and analyzing existing scholarly work or prior studies related to a specific subject. This process is vital in research as it provides context, identifies gaps in knowledge, and highlights unanswered questions. Various methods can be employed in literature reviews, including qualitative, quantitative, or a mix of both. Common techniques include comprehensive literature reviews, meta-analyses, and bibliometric studies (Donthu et al., 2021).

In this study, bibliometric analysis is used to gain a holistic view of how artificial intelligence (AI) impacts strategic and operational decision-making. This analysis helps scholars quickly understand the intellectual structure, themes, authors, and connections within this field, its evolution, the impact of research, and emerging trends. AI has demonstrated itself to be a crucial ally for businesses in supporting operational and strategic decision-making, improving the efficiency of core business activities (IJACSA, 2023). In the context of e-commerce, AI supports economic activities and information analysis for trading operations (Cavalcante et al., 2016), aids informed decision-making (Ince & Aktan, 2009), detects fraud in financial operations (Shravan Kumar & Ravi, 2016), and evaluates financial information through text analysis (Xing et al., 2018). Researchers highlight that AI technologies, such as machine learning and natural language processing, enable organizations to automate repetitive tasks and streamline decision-making processes. Utilizing AI algorithms allows businesses to process vast quantities of data quickly, reducing analysis time and facilitating real-time decision-making (Lee et al., 2020).

AI also empowers organizations to explore new opportunities, identify untapped market potentials, and develop innovative strategies (Li et al., 2017). However, the use of AI raises important concerns about data privacy and security, given the sensitive nature of the information processed (Stalidis et al., 2015). Additionally, ethical considerations such as transparency, fairness, and accountability are paramount (Wirth, 2018). AI plays a significant role in various operations, including marketing (Chopra, 2019), customer management (Marinchak et al., 2018), product launches, after-sales services (Sheta et al., 2015), and stock management (Soltani-Fesaghandis & Pooya, 2018), as well as industry 4.0 activities (Lee & Park, 2018). The speed and efficiency of AI-driven decision-making, the ability to quickly analyze complex situations, and the reduction in operational costs provide competitive advantages for businesses

(Ramakrishna et al., 2020). The advent of "Big Data" has further amplified AI's utility in organizations, referring to extensive databases of structured and unstructured data characterized by volume, diversity, velocity, and other attributes such as variability, truth, and value (Ebner et al., 2014).

2.1 Historical overview of AI in Decision-Making

Artificial Intelligence (AI) has a rich history that dates to the mid-20th century. Early efforts in AI focused on replicating human cognitive processes, with pioneers like Alan Turing proposing the Turing Test as a measure of machine intelligence (Turing, 1950). In the context of decision-making, AI's application has evolved from simple decision support systems (DSS) to sophisticated AI-driven models capable of autonomous decision-making. Early DSS focused on providing analytical support to human decision-makers (Power, 2002). However, advancements in AI technologies, particularly in machine learning and data analytics, have significantly expanded AI's capabilities, allowing it to handle complex decision-making scenarios with greater efficiency and accuracy (Turban, Sharda, & Delen, 2011).

Artificial Intelligence (AI) was coined in 1955 by Dartmouth professor John McCarthy to set his research apart from that of MIT's Norbert Wiener. In 1947, Wiener created the term cybernetics to represent his perspective on intelligent systems, closely tied to fields like operations research, statistics, pattern recognition, information theory, and control theory. McCarthy, however, emphasized AI's roots in logic and the ambitious goal of achieving human-like intelligence in both software and hardware. Wiener's approach often drew inspiration from the behavior of humans or animals, concentrating on simpler signals and decisions, while McCarthy's AI focused on the more complex aspects of human thought and reasoning. Despite advances, replicating human-level cognition remains challenging more than sixty years later, as noted by corporate researchers (Marcus, 2023; Tiku, 2022). Oxford professor Floridi (2023) elaborates on the distinction, pointing out that Large Language Models (LLMs), such as OpenAI's ChatGPT (2021), are not truly thinking or reasoning entities. Instead, they manipulate data at a statistical level, operating on the formal structures of text rather than engaging with its meaning in the same way humans do.

The evolution of AI technologies has largely come from engineering domains, drawing from fields such as pattern recognition, motion control, and statistics. Machine Learning (ML), a key aspect of AI, integrates concepts from various fields to build algorithms that can analyze

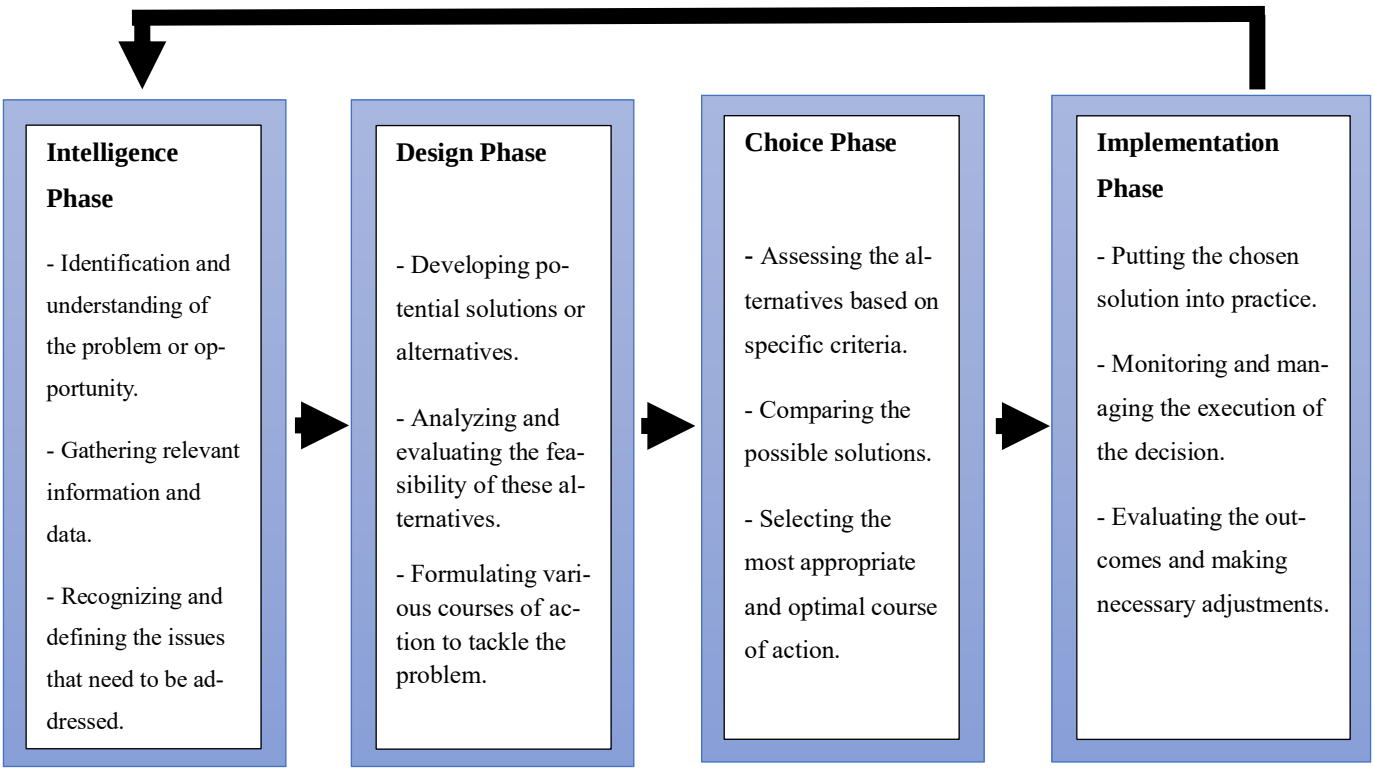
data and make predictions. These advancements suggest that Wiener's original vision may have had more influence, even if it is framed in McCarthy's terms (Jordan, 2019).

The modern focus in AI research has shifted towards areas like machine learning and deep learning, which drive innovations in fields such as healthcare, finance, and autonomous vehicles (LeCun et al., 2015). These technologies are at the forefront of AI's transformative potential, enabling applications that can analyze vast amounts of data, recognize patterns, and make complex decisions with minimal human intervention (Goodfellow et al., 2016). As AI continues to evolve, it raises new questions about ethics, governance, and the potential impact on the workforce, which are key topics for ongoing research and policy discussions (Floridi, 2023). AI has come a long way from its early days, adapting to new technologies and incorporating insights from various fields. Its progress is marked by cycles of enthusiasm and doubt, reflecting the challenges and opportunities that come with pursuing the goal of creating intelligent systems. As research continues, it's crucial to maintain a balanced perspective on AI's capabilities, acknowledging its potential while also addressing the challenges and ethical considerations that accompany its development.

2.2 The Decision-Making Process

Decision-making is a complex process that has attracted considerable attention from researchers. Herbert Simon (1997) proposed a widely accepted framework that describes how decisions are made. This framework consists of three key stages: intelligence, design, and choice, leading to implementation. The intelligence phase involves identifying the problem and gathering relevant information. In the design phase, decision-makers generate alternatives and establish criteria for evaluating them. The choice phase involves selecting the best alternative based on these criteria, followed by the implementation phase, where the decision is carried out, and the effects are observed. However, individuals often do not make perfectly rational decisions due to cognitive limitations and information constraints. Simon (1997, 1955) introduced the concept of bounded rationality, suggesting that decision-makers should be satisfied—that is, choose an option that is good enough—rather than optimize. Kahneman and Tversky's research on heuristics and biases shows that decision-makers often rely on shortcuts or heuristics, which can lead to cognitive biases like anchoring, sunk cost, or status quo bias (Kahneman, 2003; Tversky & Kahneman, 1974). These biases can impact the quality of decisions, particularly in high-velocity environments, where quick and accurate decisions are crucial (Eisenhardt & Bourgeois, 1988).

Figure 2.1 - Adopted by the author from "Description of Simon's Decision-Making Model (Doumpos and Grigoroudis, 2013)"



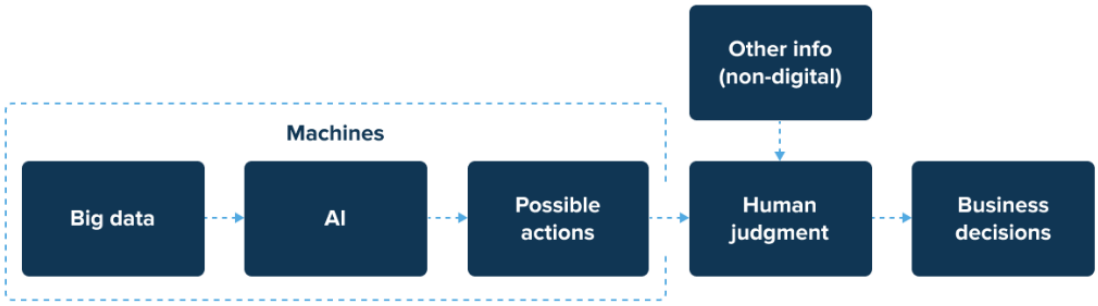
Source: Self-Elaborated

As technology has evolved, artificial intelligence (AI) has become increasingly important in supporting decision-making. AI offers tools that can help overcome human limitations, providing a more rational basis for evaluating alternatives and reducing cognitive biases (Phillips-Wren et al., 2009; Doumpos & Grigoroudis, 2013). AI systems can process large amounts of data quickly and generate insights to support the decision-making process. They can also assist in implementing decisions by providing ongoing monitoring and feedback, allowing for adjustments and corrections as needed (Phillips-Wren, 2012).

In strategic decision-making, AI has transformed the way organizations plan and make long-term choices. AI-driven analytics enable companies to identify market trends, understand customer behavior, and forecast future conditions, leading to more informed strategic decisions. AI-based predictive modeling allows organizations to anticipate risks and make proactive adjustments to their strategies, providing a competitive advantage (Brynjolfsson & McAfee, 2014).

Operational decision-making has also benefited from AI technology. AI systems can automate routine tasks, such as inventory management and workforce scheduling, improving efficiency and reducing costs (Chui et al., 2018). AI-powered chatbots and virtual assistants can enhance customer service by providing quick responses to inquiries, leading to improved customer satisfaction and operational performance.

Figure 2.2 - AI Decision-Making Model



Source: Self-elaborated

Despite its benefits, AI in decision-making also raises ethical and practical challenges. AI systems, if not carefully designed and implemented, can perpetuate, or amplify existing biases due to flawed training data or inherent algorithmic issues (Floridi et al., 2018). Furthermore, the lack of transparency in AI's decision-making process can undermine accountability and trust, as the reasoning behind AI-driven choices might not always be clear. Organizations must ensure that AI-based decisions are transparent, explainable, and fair to avoid unintended negative consequences.

2.3 Evolution of AI in Strategic and Operational Decision-Making

The evolution of AI in decision-making is marked by its increasing sophistication and expanding applications across strategic and operational domains. Initially, AI's role in strategic decision-making was limited to providing decision support through data analysis and simulation models (Turban et al., 2005). Early decision support systems (DSS) and executive information systems (EIS) enabled managers to make informed decisions based on historical data and predictive modeling. Artificial Intelligence (AI) has undergone major changes over time, having a profound impact on both strategic and operational decision-making.

The story of AI began in the mid-20th century with innovators like John McCarthy and Marvin Minsky, who aspired to create machines that could mimic intelligent behavior (Russell & Norvig, 2020). Early AI efforts were centered around rule-based systems and symbolic reasoning, with expert systems trying to replicate human expertise in specific fields. These early systems were pivotal in showing that AI could be valuable in specialized areas like medical diagnostics and financial forecasting. As technology advanced, the late 20th century brought a move from rule-based methods to machine learning (ML), propelled by greater computing power and the explosion of large datasets (LeCun et al., 2015). This transition helped AI expand its reach beyond narrow tasks to address broader strategic and operational challenges.

The journey of AI has seen alternating periods of optimism and skepticism, often known as "AI summers" and "AI winters" (Duan et al., 2019). AI summers refer to times of high research activity and positive outlooks, often due to technological breakthroughs. AI winters, on the other hand, are times when progress slows, and funding decreases due to unfulfilled expectations or technical hurdles. Understanding these cycles helps explain the ups and downs AI has experienced over the years. In more recent times, AI has had a resurgence, with machine learning and deep learning driving significant progress in both strategic and operational decision-making. AI is now a key player in sectors like finance, healthcare, and manufacturing, aiding in strategic planning, risk analysis, and process optimization (Chui et al., 2018).

Deep learning, a branch of ML, has transformed what AI can do, allowing it to identify patterns and make highly accurate predictions (LeCun et al., 2015). This has opened doors to a range of applications, such as supply chain management, customer support, and marketing, where AI plays a vital role in improving operational efficiency and providing strategic insights. In the strategic realm, contemporary AI applications include advanced analytics, scenario planning, and strategic forecasting. AI tools like IBM's Watson and Google's DeepMind utilize machine learning algorithms to analyze vast datasets, identify emerging trends, and provide strategic recommendations. These systems enhance strategic decision-making by reducing uncertainty and enabling proactive management (Brynjolfsson & McAfee, 2014).

Operational decision-making has also been transformed by AI, particularly with the rise of automation and intelligent systems. AI-powered automation in manufacturing, logistics, and customer service improves efficiency and reduces human error. For example, AI-driven supply chain management systems optimize inventory levels, predict demand fluctuations, and enhance logistics planning (Choi, Chan, & Yue, 2022).

The strategic use of AI has led to new business models where AI-driven insights are leveraged to gain a competitive edge. In operational decision-making, AI has become a valuable tool for automating repetitive tasks and optimizing processes. AI-powered systems can manage inventory, streamline supply chains, and assist in workforce scheduling, leading to significant cost savings and efficiency improvements for organizations (Russell & Norvig, 2020).

AI's impact on decision-making is not without challenges. Issues such as data privacy, algorithmic bias, and the ethical implications of autonomous decision-making must be addressed to ensure the responsible use of AI in decision-making processes (Binns, 2018). Nonetheless, the trajectory of AI in decision-making underscores its transformative potential in both strategic and operational contexts, driving organizations towards more informed, efficient, and adaptive decision-making practices.

CHAPTER 3
METHODOLOGY

Bibliometric analysis has been chosen as the methodology for the goal of this thesis. Its versatility can be used to illustrate the evolution of trends in data-driven decision making to group publications in clusters, and to visualize the relationship between themes covered. This methodology has been adopted to perform large literature reviews in the decision-making and AI field (H. Chen et al., 2012; Loureiro et al., 2021; Pietronudo et al., 2022; Raza et al., 2023; Tang & Liao, 2021). Bibliometric analysis, a method used for analyzing huge amounts of scientific data has become well known in the research community thanks to the various methods, databases and used software for example VOS viewer, Gephi, Leximancer, and scientific databases like Web of Science and Scopus. VOS viewer is a visualization tool that helps map and analyze bibliometric networks, including citation and co-authorship patterns. It provides an intuitive way to examine relationships among academic publications. Scopus, on the other hand, is a vast database that indexes scholarly literature from a broad array of journals, conferences, and research resources. In this thesis, the use of VOS viewer and Scopus is crucial for exploring and visualizing the structure of academic research, identifying influential authors, emerging trends, and understanding the broader impact of specific research topics. Together, these tools offer a comprehensive approach to analyzing the academic landscape and extracting meaningful insights from scholarly data.

3.1 Research Questions

This study intends to elaborate on the importance of AI in strategic and operational decision-making. To accomplish this, the research questions will be:

Q1: What does the bibliographic literature say about Strategic and Operational AI Decision-Making between 2015 and 2024?

Q2: What is the impact of artificial intelligence on strategic and operational Decision-Making?

Q3: What are the main challenges and barriers organizations face when integrating artificial intelligence into strategic decision-making processes, and how can these challenges be mitigated?

3.2 Identification of the Research

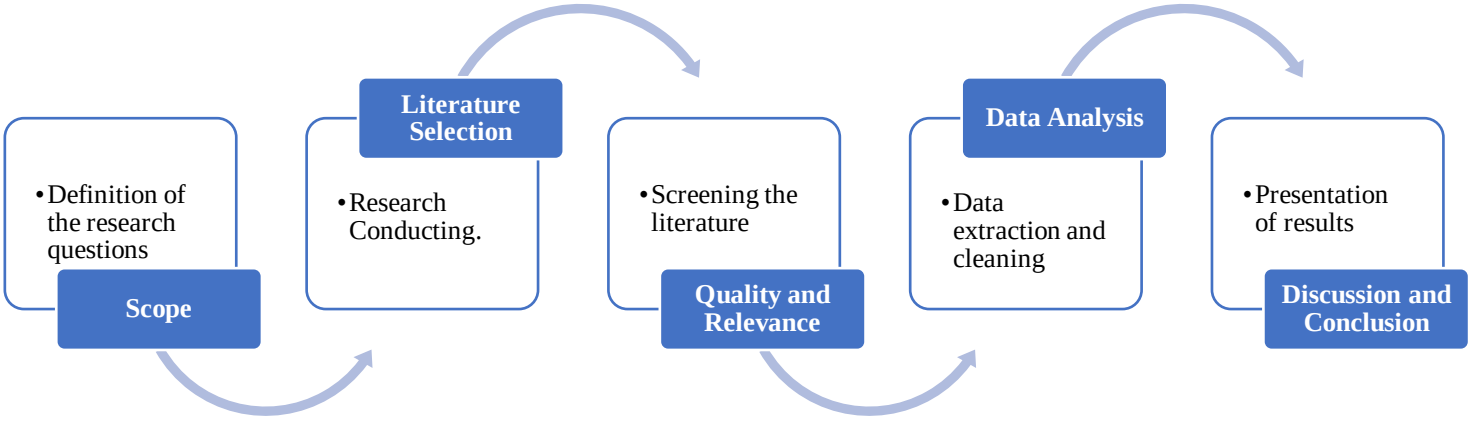
This study will follow the bibliometric analysis guidelines as outlined by the thesis supervisor in the Bibliometric State-of-the-Art Research Checklist.

Bibliometric analysis has been chosen as the primary methodology for the goal of this thesis. Its versatility can be used to illustrate the evolution of trends in data driven decision-making to group publications in clusters, and to visualize the relationship between themes covered. This methodology has been adopted to perform large literature reviews in the decision-making and AI field (H. Chen et al., 2012; Loureiro et al., 2021; Pietronudo et al., 2022; Raza et al., 2023; Tang & Liao, 2021). This is achieved by using software to analyze a vast amount of data from scientific. The increasing adoption of this methodology can be attributed to the literature coverage of these databases, the availability of Free Open-Source Software (FOSS) bibliometric software VOS viewer (Van Eck & Waltman, 2010) and the growth of scientific research itself (Donthuet al., 2021).

Utilizing the methodology of bibliography compilation, specifically systematic literature review and bibliometric analysis as outlined by recent scholars, this thesis delves into historical academic articles concerning the two central concepts under investigation, AI and decision-making, alongside contemporary management trends. This research process involves extracting keywords and research terminologies from the subject matter, followed by comprehensive analysis. To grasp the essence of this research's objectives, it is essential to understand the latest insights into bibliometric methodologies, which represent nuanced approaches to citation analysis. Drawing from contemporary scholarship, citation retrieval serves not only a descriptive but also an evaluative function, aiming to highlight relevant methodologies within a domain and trace its dynamic evolution over time (e.g., Ding et al., 2013; Waltman et al., 2016).

Advanced bibliometric techniques, refined by more recent researchers such as Leydesdorff and Rafols (2011), have significantly contributed to strategic management research, shedding light on the field's structural nuances and scholarly trends. By exploring publications and research contributions through the lens of updated literature review frameworks, such as those proposed by Greenhalgh et al. (2018), this study aims to provide a comprehensive understanding of the subject matter. The research methodology employed encompasses various phases, resulting in the creation of a thematic map, as illustrated in Figure 3.1.

Figure 3.1 - Research Method



Source: Self-elaborated

3.3 Articles Selection

The article selection process began with a search in Elsevier Scopus, which allowed a larger sample of documents to be retrieved by applying appropriate filters and keywords. This method helps to identify literature that may be relevant to the research proposal. With the initial screening of articles based on their abstracts, followed by a thorough review of the full texts, the initial sample will start to decrease. This approach will be adopted to ensure the selection of the most significant and high-quality articles. Foundations for the article's selection:

Relevance: Select articles that directly address the impact of artificial intelligence on strategic and operational Decision-Making.

Time: Focus on recent publications within the last 10 years, 2015 to 2024, to ensure relevance and timeliness of information.

3.4 Data Criteria

Searched firstly on April of 2024, it was reduced the above string of articles to include the following criteria:

1) The database used was Elsevier Scopus.

2) Search terms of Artificial Intelligence, Decision-Making, Strategy and Operational.

3) Only papers that were published after 01 January 2015 and before 31 December 2024, representing 10 years of analysis.

4) Thus, was limited to the following subject areas: Business, Management and Accounting.

5) English academic articles, conference papers, reviews, and book chapters.

6) The research method was as broad as possible but retrieved to a specific field of artificial intelligence in decision-making.

3.5 Research Questions & Activities

To accomplish the main goal under study in this investigation, specific objectives were established and three research questions (RQs) around the problem appeared to be answered. In Table 1 these questions are presented, linked at the same to specific objectives and findings of each topic raised from the literature review introduced in chapter 2.

Table 2.1 - Research Activities and Research Questions

Research Activities	Research Questions
1) Conduct a literature review of academic publications between 2015 and 2024. 2) Identify key themes, trends, advancements and assess the geographical distribution of research output.	Q1: What does the bibliographic literature say about Strategic and Operational AI Decision-Making between 2015 and 2024?
1) Identify and analyze case studies of industries where AI has been implemented for decision-making, identifying the benefits and drawbacks. 2) Determine the key factors that drive the adoption of AI technologies in both strategic and operational decision-making.	Q2: What is the impact of artificial intelligence on strategic and operational Decision-Making?

1) Identify the advantages and opportunities according to the literature review between 2015 and 2024. 2) Which are the challenges and barriers literature review between 2015 and 2024 and how can they be attenuated?	Q3: What are the main challenges and barriers organizations face when integrating artificial intelligence into operational and strategic decision-making processes, and how can these challenges be mitigated?

Source: Self-constructed

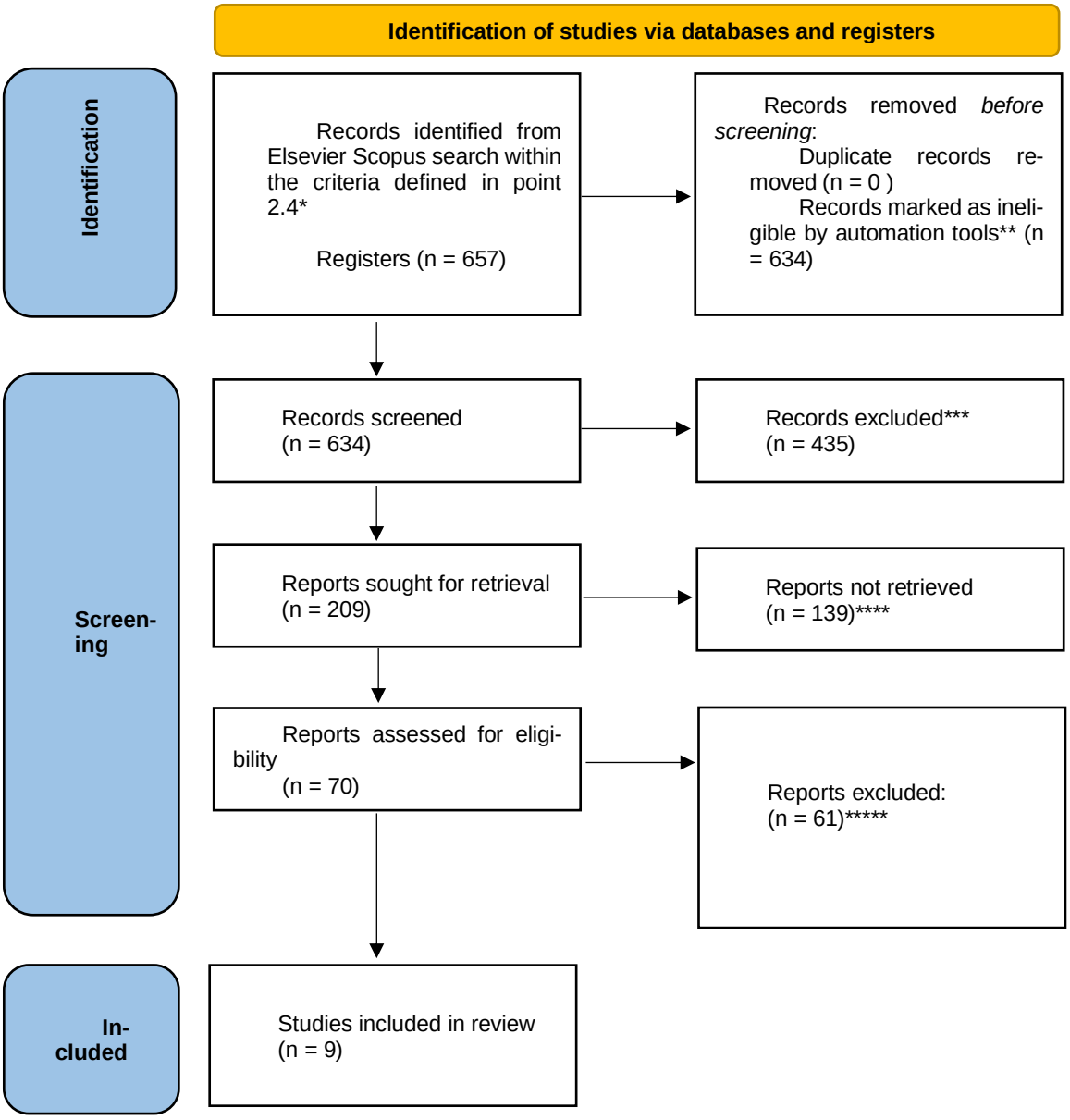
3.6 Articles Screening

The research articles underwent a meticulous screening process following the PRISMA Methodology, a renowned guideline for conducting systematic reviews and meta-analyses across various disciplines. PRISMA, an acronym for Preferred Reporting Items for Systematic Reviews and Meta-Analyses, was introduced by Moher et al. (2009) to ensure transparency and completeness in reporting research findings. Liberati et al. (2009) provided an explanatory document to complement the PRISMA Statement, offering comprehensive elaboration on each reporting item. The recent PRISMA 2020 update, as delineated by Page et al. (2021), further refined and augmented the reporting standards, providing updated guidance for authors, editors, and peer reviewers involved in systematic reviews. The PRISMA methodology encompasses several pivotal steps, including planning, literature search, study selection, data extraction, quality assessment, data synthesis, results reporting, discussion and conclusion.

In adherence to the PRISMA Methodology (Page et al., 2021), the screening process commenced with a meticulous search conducted in April of 2024, utilizing Elsevier Scopus as the primary database. The articles were subjected to screening following the PRISMA Methodology (Page et al., 2021), wherein a search was conducted on April of 2024, utilizing Elsevier Scopus as the database, focusing on articles published between January 1st of 2015, and before December 31st of 2024, resulting in 657 records identified through the search terms "AI", "Artificial Intelligence", “Strategy” and “Operation”. Subsequently, the screening process was refined by applying filters, including English language academic articles, reviews, conference papers, and book chapters, and restricting the research to areas of Business, Management and Accounting and Decision Sciences. After selecting the subject’s area of business management and accounting and economics, 634 documents remained, of which 435 were excluded due to

having greater than or equal to 5 citations and being before 2019. This led to 209 reports being sought for retrieval, with 61 further records excluded due to the absence of full text available. Ultimately, 70 reports were assessed for eligibility, with 61 excluded for being highly specific studies unrelated to the broader AI impact on the strategic and operational decision-making, resulting in 9 studies included in the final review.

Figure 3.2 - PRISMA Methodology



*Subjects Area of Business Management and Accounting and Economics.

** Used filter of Elsevier Scopus of limit language to English; Document type of Article, Review, Conference Paper, and Book Chapter resulting in 634 documents found.

***Excluded due to having less than 5 citations and being before 2019.

**** Excluded due to the absence of full text available.

*****Excluded because they are highly specific studies unrelated to Decision-Making in the business environment.

CHAPTER 4

BIBLIOMETRIC ANALYSIS

4.1 Overall Findings

4.1.1 Elsevier Scopus

Global Data Elsevier Scopus

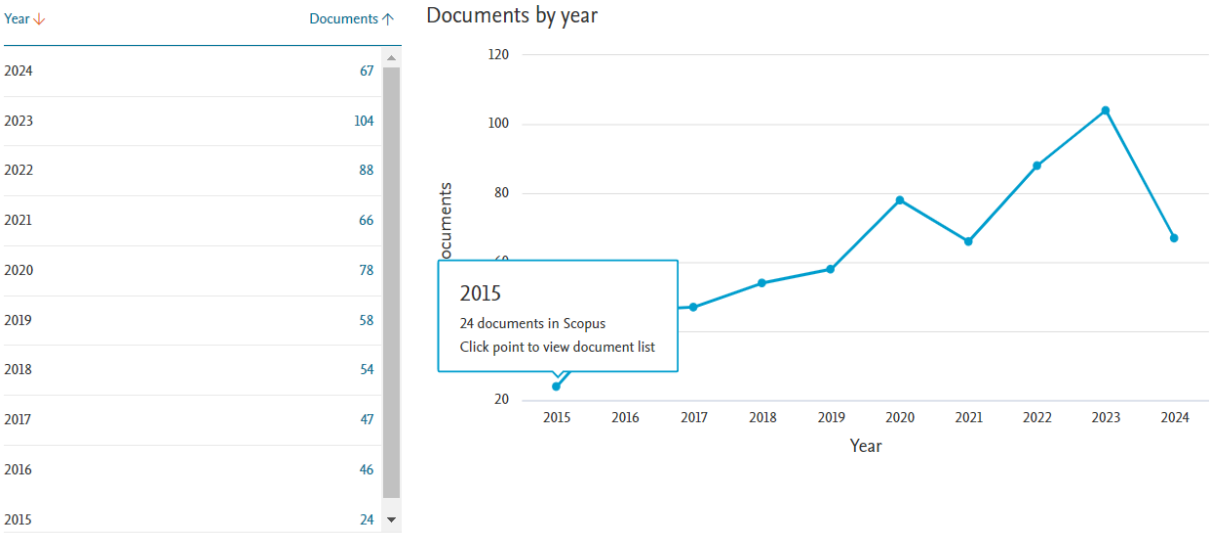
In this chapter, Elsevier Scopus was used as the search engine, which is a comprehensive database that provides access to a wide range of scholarly literature. The papers were identified by searching the keywords AI, Decision-Making, Strategy and Operation, between 1st January 2015 and before December 31st of 2024. A total number of 657 results were found.

TITLE-ABS-KEY (ai* AND decision-making* AND strateg* AND operation*) AND PUBYEAR > 2014 AND PUBYEAR < 2025 AND (LIMIT-TO (SUBJAREA , "BUSI")

4.1.2 Documents per year

Figure 4.1, presents the total publications per year between the period between 2015 and 2024 (period of study), showing these documents have been increasing their popularity The year 2023 had the highest number of publications, whereas 2015 had the lowest. The findings reveal a noticeable upward trajectory over the last ten years.

Figure 4.1 - Documents by Year

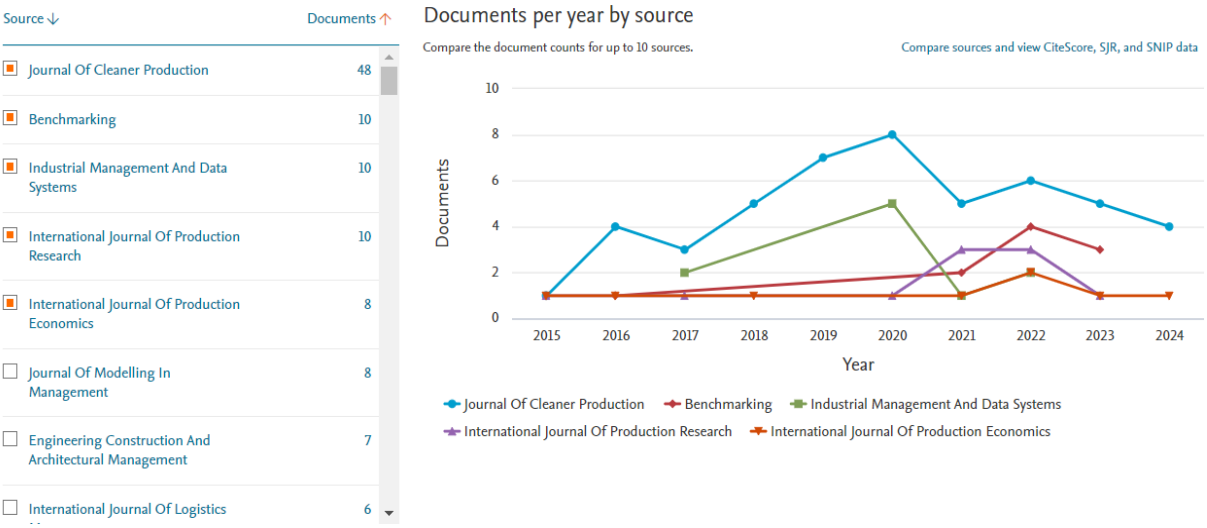


Source: Elsevier Scopus Website

4.1.3 Top Publishing Sources

Over the past 10 years, it is presented in Figure 4.2, the sources that published the most on the subjects are from the Journal of Cleaner Production.

Figure 4.2 - Documents per Year by Source

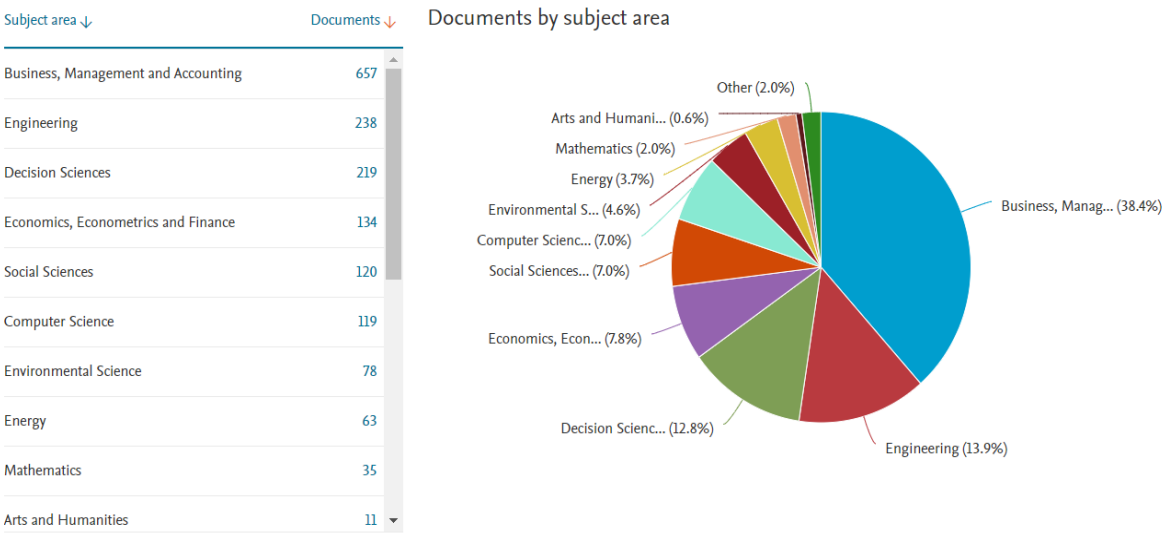


Source: Elsevier Scopus Website

4.1.4 Total by Subject Area

From the 657 results extracted (38,4%) of the documents are from the area of Business, Management and Accounting, and from the area of Decision Sciences (12,8%)

Figure 4.3 - Documents by subject area

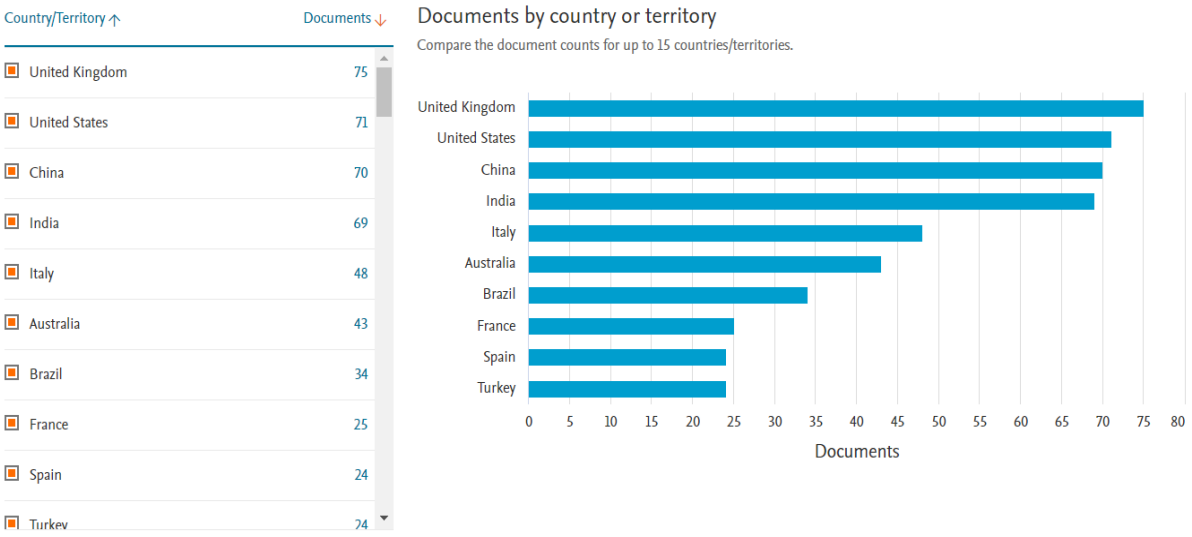


Source: Elsevier Scopus Website

4.1.5 Geographics

The results in Figure 4.4 show, by descending order of document count per country, that publications are mostly based between United Kingdom, United States, China, India, Italy, Australia, Brazil, France, Spain, and Turkey.

Figure 4.4 - Documents by country or territory



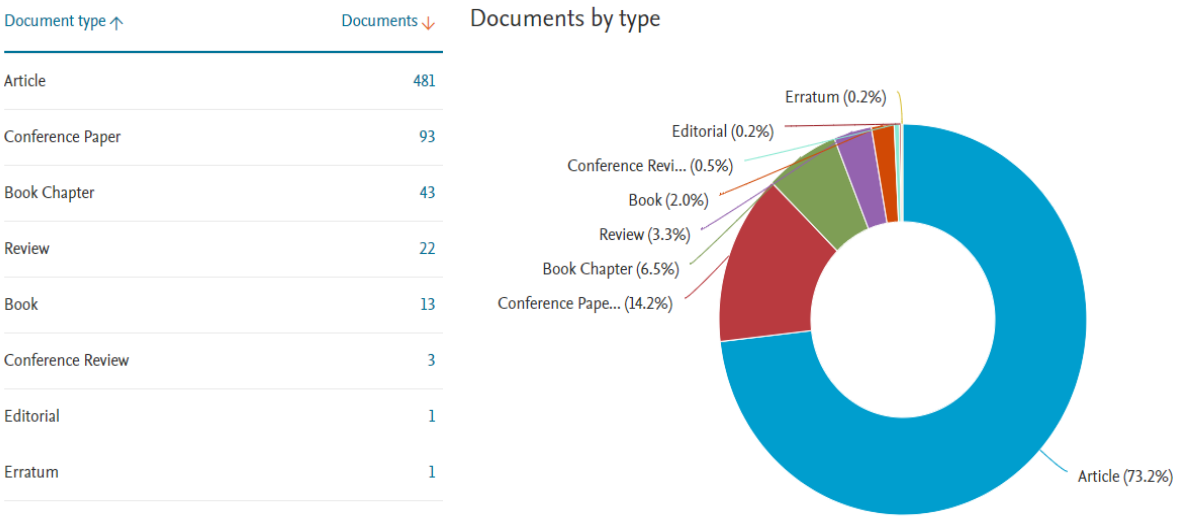
Country/Territory	Documents
United Kingdom	75
United States	71
China	70
India	69
Italy	48
Australia	43
Brazil	34
France	25
Spain	24
Turkey	24

Source: Elsevier Scopus Website

4.1.6 Type of Document

As shown in Figure 4.5, most of the publications were made based on articles representing (73.2%) of the data, showing the impact of the topic on the scientific community.

Figure 4.5 - Documents by type



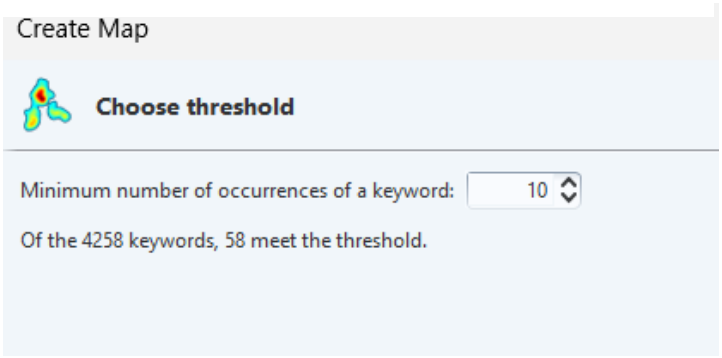
Document type	Documents
Article	481
Conference Paper	93
Book Chapter	43
Review	22
Book	13
Conference Review	3
Editorial	1
Erratum	1

Source: Elsevier Scopus Website

4.1.7 Keywords Selection

The co-occurrence of keywords was mapped using VOS Viewer on the dataset of the 657 documents returned by the Scopus search. This allows for the visualization of the network of the main keywords and provides information about thematic relationships and patterns in a specific research domain by grouping them into clusters. Figure 4.6 shows that 10 keywords were chosen from a total of 4258.

Figure 4.6 - Minimum Number of Occurrence of a Keyword

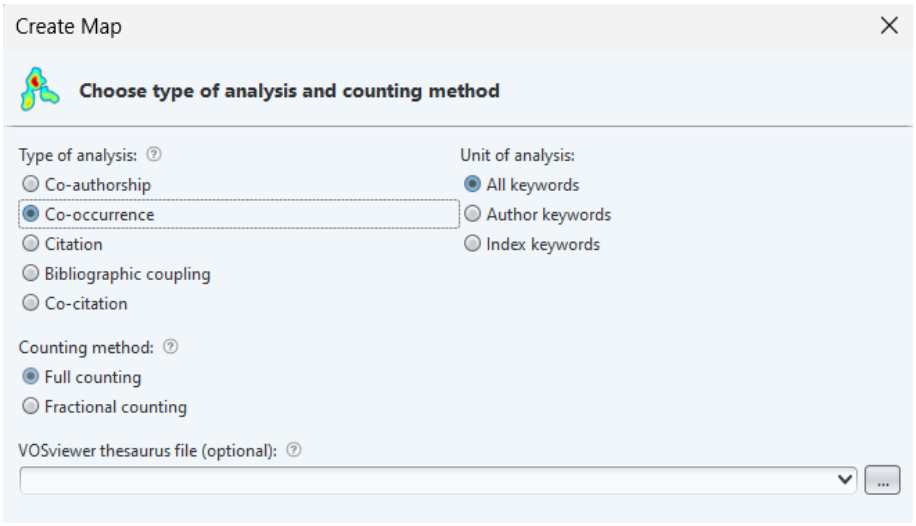


Source: Vos Viewer

4.1.8 Keyword Co-Occurrence Map

Map the keyword co-occurrence map in Figure 4.7 enables the identification of a keyword's frequency of occurrence based on its size. The bigger the word, the more common it is.

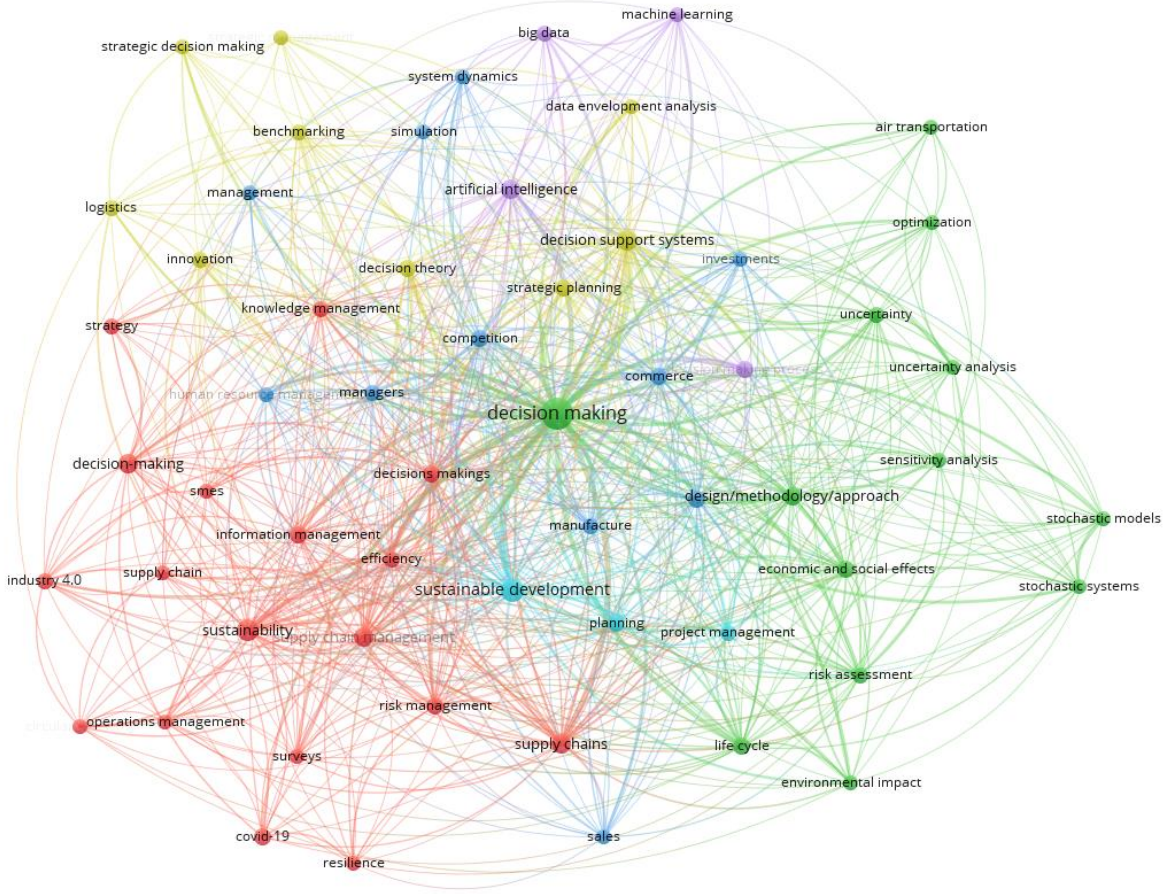
Figure 4.7. Co-ocurrence Map



Source: Vos Viewer

Furthermore, the distance between two keywords indicates the strength of their co-occurrence relationship (van Eck & Waltman, 2011).

Figure 4.8 - Keywords Map Clusters



Source: Vos Viewer

As illustrated in Figure 4.8, the term "Decision-Making" stands out as the most used keyword. Additionally, there is a notable association between "Decision-Making" and the terms “Decision Support Systems”, "Artificial Intelligence" and "Sustainable Development" indicating a higher recurrence and a robust co-occurrence pattern in the analyzed documents. This suggests that "Decision-Making" frequently appears alongside either "Artificial Intelligence" or "Sustainable Development" or “Decision Support Systems” in the documents under examination.

In Table 4.1, the VOS viewer generated 6 Keyword clusters, each representing a set of keywords with a substantial co-occurrence relationship. This implies that keywords within the

same cluster tend to appear together frequently in the analyzed documents, whereas keywords from different clusters exhibit a less frequent occurrence when paired.

Table 4.1 - Keyword Clusters

Supply Chains (18 Items)	Decision-Making (13 Items)	Commerce (11 Items)	Decision Support Systems (9 Items)	Artificial Intelligence (4 Items)	Sustainable Development (3 Items)
Circular economy, covid-19, decision-making, decisions makings, efficiency, industry 4.0, information management, knowledge management, operations management, resilience, risk management, SMES, strategy, supply chain, supply chain management, supply chains, surveys, sustainability.	Air transportation, Decision-Making, design/methodology/approach, economic and social effects, environmental impact, life cycle, optimization, risk assessment, sensitivity analysis, stochastic models' stochastic systems, uncertainty, uncertainty analysis.	Commerce, competition, costs, human resource management, investments, management, managers, manufacture, sales, simulation, system dynamics.	Benchmarking, data envelopment analysis, decision support systems, decision theory, innovation, logistics, strategic Decision-Making, strategic management, strategic planning.	Artificial intelligence, big data, Decision-Making process, strategic management, strategic planning.	Planning, project management, sustainable development.

Source: Self-elaborated

4.2 Data Analysis

4.2.1 Data Cleaning

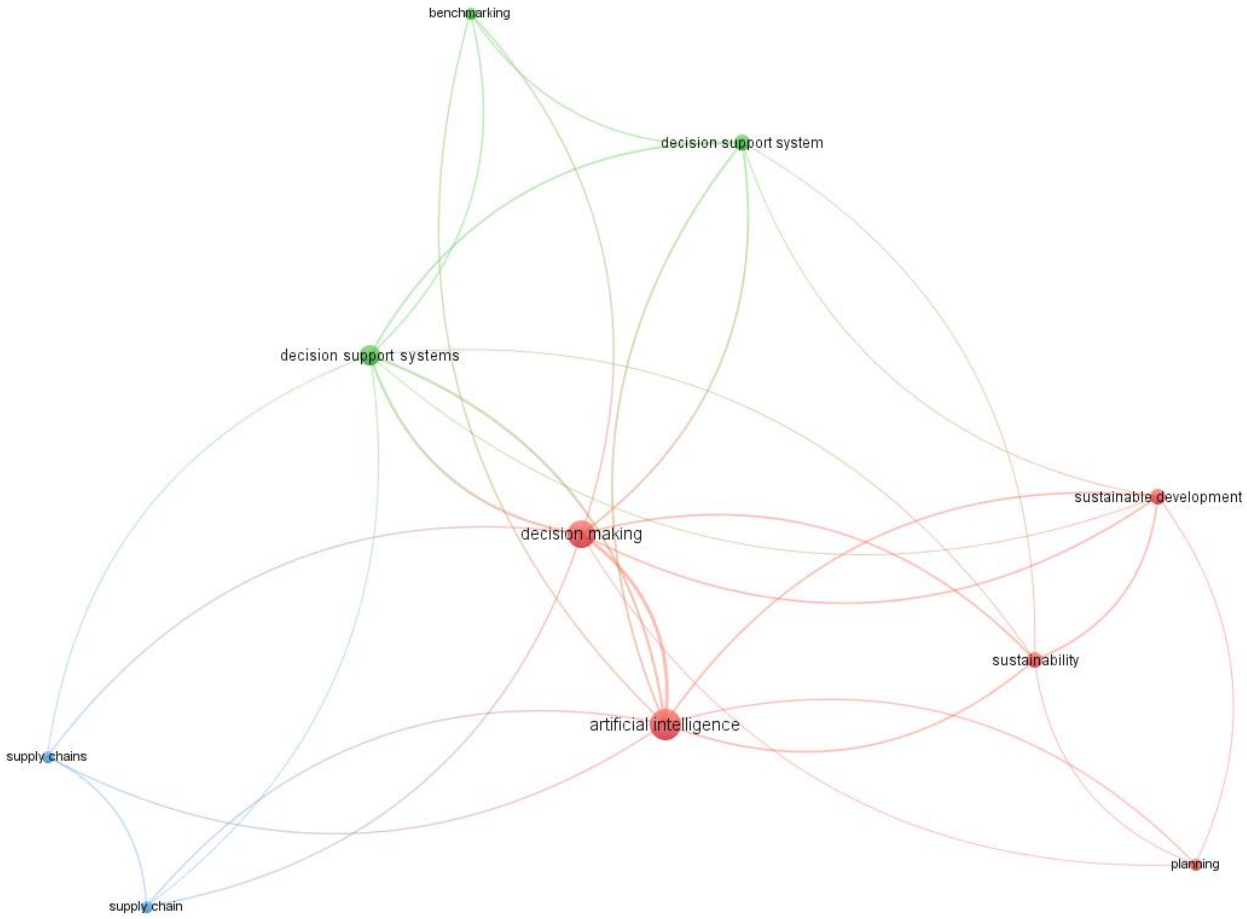
After reading the titles of the documents and considering the subject area of business management and accounting and economics, 634 papers remained after a first triage of the 657 documents returned by the search in Elsevier Scopus. After that, to guarantee the quality of the papers the data was restricted to papers after the year 2019, resulting in 209 papers. Following that, a second screening was performed by reading each abstract to ensure the relevance and

quality of the documents and by eliminating the documents that required payment. After the second screening, 9 documents were left, which are listed in Annex A.

4.2.2 Main Publications Keywords

By analyzing the keywords from the selected articles, as shown in Figure 4.8, it is now more in line with the research questions and objectives. However, an analysis of a map based on text data was performed to understand the relevance of these keywords (Figure 4.6). This map illustrates the terms that are more relevant in the papers in Annex A. The colors in the term map represent the density of terms, with blue representing the lowest density and red representing the highest density. Relevant terms include artificial intelligence, decision-making, sustainable development, supply chains. with the one with the lowest density being knowledge.

Figure 4.9 - Keywords of articles selected



Source: Vos Viewer

The term map analysis conducted using VOS viewer yielded three clusters, as outlined in Table 4.2 below. These two clusters encapsulate the dimensions of the bibliographic network.

Table 4.2 - Term Map Clusters

Artificial Intelligence (5 Items)	Decision Support System (3 Items)	Supply Chain (2 Items)
Artificial intelligence, Decision-Making, planning, sustainability, sustainable development.	Benchmarking, decision support system, decision support systems.	Supply chain, supply chains.

Source: Self elaborated from Vos Viewer Data

CHAPTER 5

DISCUSSION AND FINDINGS

In this chapter, it will be discussed the outputs and findings. Throughout a bibliometric analysis, a total of 657 articles were initially identified through a search on Elsevier Scopus Database, focusing on the subject areas of business management, accounting, and economics. To refine the dataset, titles were carefully examined, leading to the exclusion of articles outside these core themes, resulting in a preliminary set of 634 papers. To ensure quality, this set was further narrowed to include articles with greater than or equal to 5 citations and being after 2019, bringing the count down to 209 papers. A subsequent screening, involving a thorough review of abstracts to confirm relevance and eliminate paywalled content, ultimately yielded 9 key documents. The findings presented below are derived from this rigorous process, with the final selection providing a solid foundation for analysis and insight into the specified research areas. The complete list of these documents can be found in Annex A.

5.1 Bibliometric Insights: Strategic and Operational AI Decision-Making from 2015 to 2024

5.1.1 Strategic and Operational AI Decision-Making: A Literature Review (2015-2024)

(Q1): What does the bibliographic literature say about Strategic and Operational AI Decision-Making between 2015 and 2024?

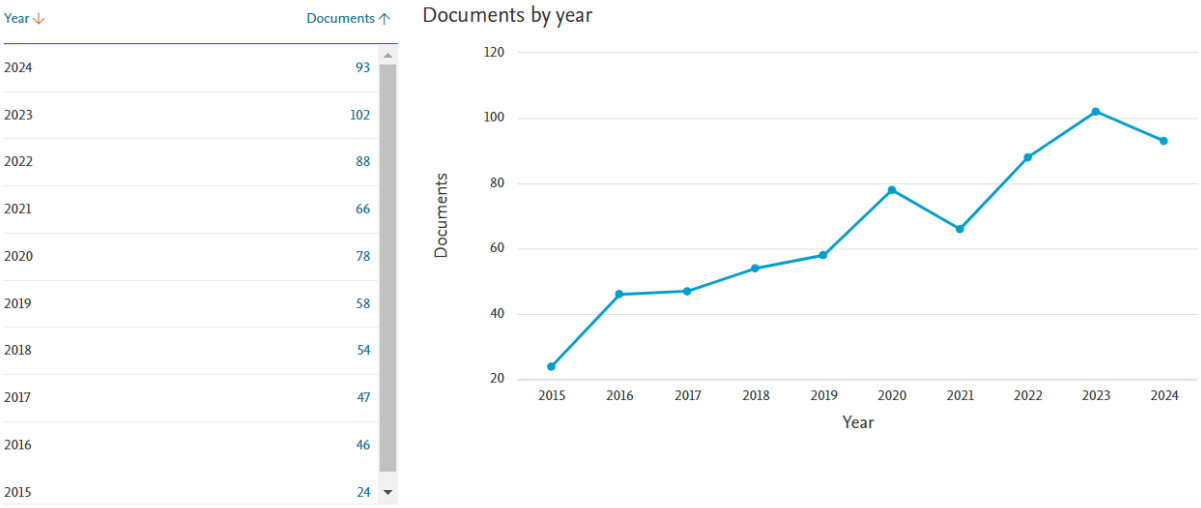
Research Activities:

1) Conduct a literature review of academic publications between 2015 and 2024.
2) Identify key themes, trends, advancements and assess the geographical distribution of research output.

The systematic literature review conducted evolves a landscape of academic research pertaining to the impact of artificial intelligence (AI) on strategic and operational decision-making from 2015 to 2024. The Research Activities were meticulously crafted to analyze publication trends, distribution across various scholarly sources, and geographical contributions during this specified timeframe. Analysis of the data unequivocally demonstrates a notable upward trajectory in academic publications over the past decade. Commencing with a modest output in 2015, the publications steadily increased from 2015 to 2020, then from 2020 to 2021 occurred a significative downfall due to the pandemic period. After the pandemic hit, from 2021 to 2023 there was a very significative upward, reaching an all-time high in 2023. Regarding 2024, since this

analysis was made in the 1st semester, the end year results are unconclusive, but most likely higher than 2023. This trajectory signifies an increase of scholarly interest and engagement with the integration of artificial intelligence into strategic and operational decision-making processes. The consistent rise in publications suggests a growing recognition among researchers, academics, and industry professionals of the transformative potential of AI in enhancing decision-making efficiency and effectiveness.

Figure 5.1 - Number of documents variation per year



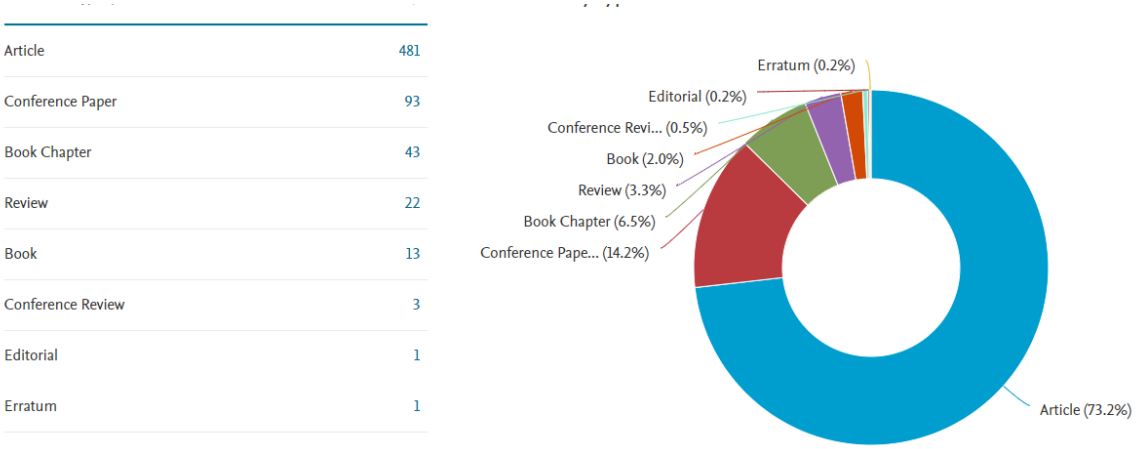
Source: Elsevier Scopus Website

The diversity in publication sources, spanning articles, reviews, conference papers, book chapters, and books, underscores the multifaceted nature of research in AI and Decision-

Making. Articles constitute the predominant form of publication, indicating a preference for in-depth analysis and exploration of specific aspects of AI's impact on decision-making processes.

The inclusion of reviews highlights a scholarly inclination towards synthesizing existing knowledge and providing comprehensive insights into the field. Moreover, the presence of conference papers, book chapters, and books underscores the dissemination of knowledge across various platforms, catering to diverse audiences and contributing to the richness of the academic discourse on AI and decision-making.

Figure 5.2 - Quantity of documents by type in %

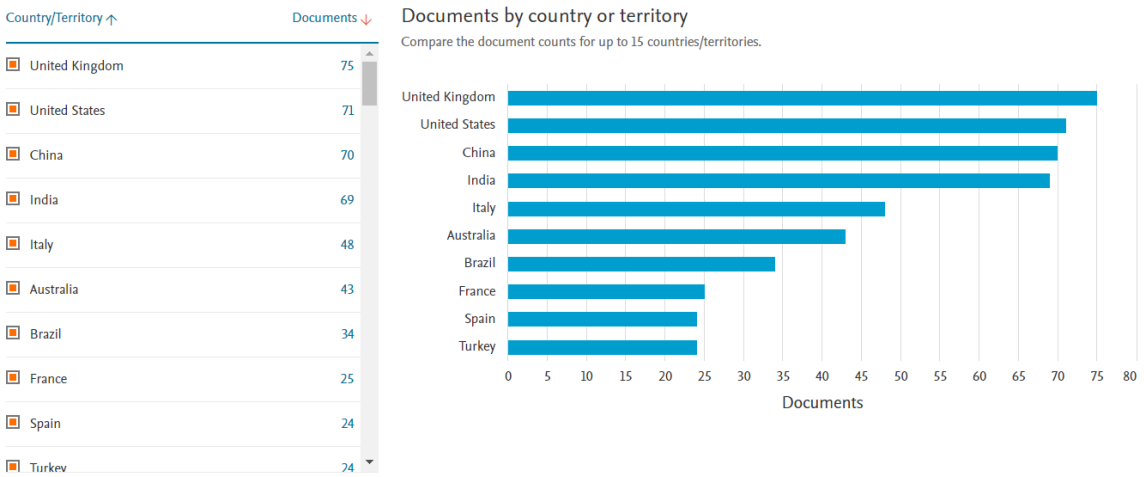


Article	481
Conference Paper	93
Book Chapter	43
Review	22
Book	13
Conference Review	3
Editorial	1
Erratum	1

Source: Elsevier Scopus Website

The global perspective, as reflected in the geographical distribution of research output, underscores the collaborative and widespread interest in AI within the realm of decision-making. Leading contributions from countries such as the United Kingdom, United States, China, India, Italy, Australia, Brazil, France, Spain, and Turkey, highlight a global community (counts for up to 15 countries/territories) of researchers actively contributing to the understanding of AI's impact on strategic and operational decision-making. This geographical diversity not only enriches the research landscape but also underscores the universal relevance of AI in reshaping decision-making processes across different industries and sectors.

Figure 5.3 - Number of documents by country or territory



Country/Territory	Documents
United Kingdom	75
United States	71
China	70
India	69
Italy	48
Australia	43
Brazil	34
France	25
Spain	24
Turkey	24

Source: Elsevier Scopus Website

In conclusion, the findings of this study reveal a clear and consistent upward trend in academic publications related to the impact of AI on strategic and operational decision-making from 2015 to 2024. The increasing volume of research output, diverse publication sources, and global contributions collectively depict a field that is dynamically evolving and capturing the attention of scholars worldwide. These results contribute valuable insights to the broader discourse on the intersection of artificial intelligence and decision-making, informing future research directions and strategic considerations for stakeholders in academia and various industries.

5.1.2 Global Trends and Key Insights in AI Decision-Making Research (2015-2024)

(Q2): What is the impact of artificial intelligence on strategic and operational Decision-Making?

Research Activities:

1) Identify and analyze case studies of industries where AI has been implemented for decision-making, identifying the benefits and drawbacks.
2) Determine the key factors that drive the adoption of AI technologies in both strategic and operational decision-making.

5.1.2.1 Benefits and Drawbacks

Strategic Impact

Regarding AI Decision-Making in the strategic component, the following studies have a significant impact, with consequent benefits and drawbacks. For example, considering the legal and compliance impact in audit, a study by Hu, K.-H., Chen, F.-H., Hsu, M.-F., and Tzeng, G.-H. in "Governance of artificial intelligence applications in a business audit via a fusion fuzzy multiple rule-based decision-making model", examined AI in business auditing using a fuzzy multiple rule-based decision-making model. This application enhanced audit accuracy and efficiency, promoting data-driven governance. However, drawbacks included the complexity of rule-based systems, the need for expert interpretation, and potential data quality issues.

Considering the strategic marketing decision-making, according to Stone, M., Aravopoulou, E., Ekinci, Y., Machtynger, J., and Machtynger, L. "Artificial intelligence (AI) in strategic marketing decision-making: a research agenda", they've investigated AI in strategic marketing decision-making, proposing a research agenda, and they've found that AI's data-driven insights can guide strategic marketing efforts, allowing companies to better understand consumer

behavior and trends. However, the use of AI in marketing raises concerns about consumer privacy, data protection, and ethical marketing practices.

Within the sustainability strategy, Wilson, C., and van der Velden, M. studied the role of sustainable AI in public sector decision-making in the article "Sustainable AI: An integrated model to guide public sector decision-making", which supports sustainability goals and ethical AI practices but also raises ethical concerns, data privacy issues, and the need for AI model transparency.

Andres, B., and Poler, R. "A decision support system for the collaborative selection of strategies in enterprise networks" discussed a decision support system for collaborative strategy selection in enterprise networks. This approach can help organizations align their strategies across multiple enterprises, promoting collaboration and shared objectives. The key challenge in this context is the coordination among different organizations with potentially conflicting goals, requiring AI systems that can manage these complexities while supporting collaborative decision-making

Operational Impact

Considering AI decision-making in the operational component, the following studies have a significant impact, with consequent benefits and drawbacks. In supply chains, Agrawal, R., Wankhede, V.A., Kumar, A., and Luthra, S. "A systematic and network-based analysis of data-driven quality management in supply chains and proposed future research directions", this article explored data-driven quality management. AI contributed to better supply chain efficiency, quality control, and proactive risk management. Yet, challenges arose in data integration and traditional environments, where resistance to change is common.

Similarly, Ahmad, T., Zhang, D., Huang, C., Song, Y., and Chen, H. "Artificial intelligence in sustainable energy industry: Status Quo, challenges and opportunities", investigated AI in the sustainable energy industry. The benefits include energy optimization, reduced environmental impact, and support for renewable energy initiatives, but the industry must contend with high initial costs, technical complexity, and regulatory hurdles.

Ghandour, A. "Opportunities and Challenges of Artificial Intelligence in Banking: Systematic Literature Review", focused on AI in banking, demonstrating improved customer service, personalized banking experiences, and enhanced fraud detection. Nonetheless, the banking sector faces privacy and security concerns, regulatory compliance issues, and ethical

considerations in automated decision-making. Across these industries, key factors driving AI adoption include technological advancements, data availability, operational efficiency, cost reduction, risk management, compliance, and customer expectations for personalized services.

Qaiser, F.H., Ahmed, K., Sykora, M., Choudhary, A., and Simpson, M. "Decision support systems for sustainable logistics: A review & bibliometric analysis" reviewed decision support systems for sustainable logistics, focusing on a bibliometric analysis. Their findings indicate that AI can help optimize logistics processes, contributing to sustainability and efficiency. Nevertheless, the adoption of AI in logistics often involves complex data management, integration with existing systems, and ensuring ethical practices.

5.1.2.2 Key Factors for AI Adoption

The adoption of AI technologies in both strategic and operational decision-making is driven by various factors across different industries. Considering the articles above, we can identify various key factors that promote AI adoption.

Strategic Impact

Considering the strategic impact within the key drivers, the following were identified within the literature. Competitive advantage as a key factor is highlighted in "Decision support systems for sustainable logistics: A review & bibliometric analysis" by Qaiser et al., where AI-based decision support systems enhance logistics. Similarly, in "Designing an efficient humanitarian supply network" by Charles et al., AI contributes to improved resource allocation and operational efficiency, giving humanitarian organizations a competitive edge in managing aid delivery. Strategic alignment demonstrates to be another important concept when talking about key factors. AI fosters collaboration and strategic alignment among business departments and networks. In "A decision support system for the collaborative selection of strategies in enterprise networks" by Andres and Poler, AI enables collaborative decision-making among networked enterprises. These key factors demonstrate that the adoption of AI technologies in both strategic and operational decision-making are driven by a combination of data-driven insights, efficiency gains, risk management, customer-focused strategies, sustainability goals, competitive advantage, and enhanced collaboration. These factors reflect the varied ways AI can contribute to improved decision-making across industries.

Operational Impact

As for the operational impact, the key drivers that were identified within the literature are: First, data availability and advanced analytics. AI technologies rely on large volumes of data to generate insights. In "A systematic and network-based analysis of data-driven quality management in supply chains and proposed future research directions" by Agrawal et al., the abundance of data in supply chains enables AI to improve quality management and risk assessment.

Similarly, in "Artificial intelligence in sustainable energy industry: Status Quo, challenges, and opportunities" by Ahmad et al., AI leverages big data to optimize energy production and consumption. Efficiency and automation are a very important key factor when talking about the implementation of AI, because it can automate routine tasks, leading to increased efficiency and cost reduction. This drive for efficiency is also evident in "Artificial intelligence (AI) in strategic marketing decision-making: a research agenda" by Stone et al., were AI streamlines marketing operations. AI can also offer advanced tools for risk assessment and compliance.

Fraud detection and compliance are also key factors, where they can be identified in "Opportunities and Challenges of Artificial Intelligence in Banking: Systematic Literature Review" by Ghandour, AI plays a key role in fraud detection and compliance in banking. Similarly, in "Governance of artificial intelligence applications in a business audit via a fusion fuzzy multiple rule-based decision-making model" by Hu et al., AI supports business audits, ensuring compliance and governance.

In conclusion, AI has a profound impact on both strategic and operational decision-making across various sectors. Strategically, AI enhances competitive advantage through data-driven insights, guiding marketing, auditing, and supply chain planning. It promotes collaboration and strategic alignment, as seen in the studies by Stone et al. and Oger et al. However, challenges include system complexity, data quality issues, and ethical concerns, particularly regarding consumer privacy and data protection.

Overall, AI adoption is propelled by key factors like efficiency gains, risk management, and sustainability goals. Addressing these challenges while leveraging AI's transformative potential will be essential for businesses and industries moving forward.

5.1.3 The Evolution of AI in Strategic and Operational Decision-Making: A Decade of Research (2015-2024)

(Q3): What are the main challenges and barriers organizations face when integrating artificial intelligence into operational and strategic decision-making processes, and how can these challenges be mitigated?

Research Activities:

1) Identify the advantages and opportunities according to the literature review between 2015 and 2024.
2) Which are the challenges and barriers literature review between 2015 and 2024 and how can they be attenuated?

Between 2015 and 2024, Artificial Intelligence (AI) has emerged as a transformative force across industries, providing significant advantages and opportunities while also presenting considerable challenges and barriers. AI's strategic and operational impacts have reshaped how companies approach customer experience, personalization, sustainability, compliance, and risk management.

5.1.3.1 Advantages and opportunities

Strategic Impact

Regarding the strategical advantages and opportunities, AI has become a critical driver of competitive advantage, particularly in enhancing customer experience and personalization. Ghandour's article, "Opportunities and Challenges of Artificial Intelligence in Banking," shows how AI has revolutionized the banking experience by enabling personalized services. AI allows banks to tailor their offerings to individual customer needs, resulting in improved customer satisfaction and retention. Similarly, Stone et al.'s "Artificial intelligence (AI) in strategic marketing decision-making" demonstrates AI's pivotal role in creating personalized marketing strategies, helping businesses target specific customer segments with customized campaigns, leading to higher engagement and sales.

Beyond personalization, AI has supported strategic sustainability initiatives, a growing priority in today's business landscape. Benabdellah et al.'s "Design for the environment" illustrates how AI contributes to green product development, emphasizing its role in supporting environmentally conscious business practices. AI's role in sustainability is further highlighted in Ahmad et

al.'s "Artificial intelligence in sustainable energy industry," where AI is shown to optimize energy production and promote renewable energy sources.

These capabilities align with companies' strategic goals to reduce their carbon footprint and embrace sustainability. AI has also been instrumental in enabling data-driven strategic decisions. In "A systematic and network-based analysis of data-driven quality management in supply chains," Agrawal et al. demonstrate how AI's advanced data analytics capabilities improve quality management. This data-driven approach allows companies to identify trends, optimize processes, and make informed strategic decisions. Additionally, AI has proven valuable in risk management and compliance. Hu et al.'s "Governance of artificial intelligence applications in a business audit" showcases AI's role in streamlining business audits, while Ghandour's work on AI in banking highlights its effectiveness in fraud detection, underscoring its strategic importance in mitigating risks and ensuring compliance.

As for the strategical challenges and barriers, despite AI's strategic benefits, its adoption poses significant challenges. Data privacy and security are among the most critical concerns, especially in industries dealing with sensitive customer information like banking. Ghandour emphasizes the need for robust encryption, strict data protection policies, and compliance with regulations to ensure customer trust and confidentiality. To address these issues, organizations must establish strong data governance frameworks and conduct regular security audits. Ethical concerns, particularly regarding algorithmic bias and transparency, require a proactive approach. Wilson and van der Velden's "Sustainable AI" recommends transparency in AI systems and suggests implementing bias audits and using diverse datasets to mitigate ethical risks.

By promoting inclusive development teams and conducting regular assessments, companies can ensure that AI-driven strategic decisions are fair and unbiased. Integration challenges represent another significant barrier to AI adoption. As noted by Oger et al.'s "Strategic Supply Chain Planning and Risk Management," integrating AI into existing systems can be complex and require comprehensive training and planning. Modular AI systems and incremental implementation can help ease the integration process, allowing organizations to adapt without disrupting ongoing operations.

Operational Impact

Regarding the operational advantages and opportunities, AI's most prominent advantage in operations is its ability to automate routine tasks, leading to significant gains in efficiency. Ahmad et al.'s "Artificial intelligence in sustainable energy industry" demonstrates how AI-driven

automation can optimize energy production and consumption, improving operational efficiency in the energy sector. By reducing manual labor and increasing accuracy, AI allows energy companies to make better use of resources and decrease costs, while contributing to sustainability goals. In the banking sector, AI has revolutionized customer service by automating repetitive processes, thereby improving responsiveness and accuracy. According to Ghandour's "Opportunities and Challenges of Artificial Intelligence in Banking," AI-based automation has enhanced customer service by enabling faster response times and personalized interactions, leading to improved customer satisfaction. Similarly, Stone et al.'s work on AI in marketing indicates that AI can process vast datasets to tailor marketing campaigns, streamline operations, and improve the effectiveness of marketing strategies.

AI's role in risk management and compliance is equally noteworthy. Hu et al.'s "Governance of artificial intelligence applications in a business audit" showcases AI's ability to streamline audit processes by automating complex tasks and reducing human error, which is crucial for maintaining compliance in heavily regulated industries. Ghandour's article on AI in banking highlights AI's effectiveness in fraud detection, reinforcing its operational utility in identifying potential risks and ensuring compliance with regulations. AI has also transformed supply chain operations, where efficiency is paramount. Oger et al.'s "Strategic Supply Chain Planning and Risk Management" indicates that AI-based decision support systems can improve supply chain efficiency by optimizing processes and facilitating collaboration among different business units. This leads to better resource allocation and a more responsive supply chain, critical for meeting customer demands and reducing operational costs.

5.1.3.2 Challenges and Barriers

Strategic Impact

The integration of AI into decision-making processes presents both challenges and barriers across various industries. The integration of Artificial Intelligence (AI) into decision-making processes presents both substantial benefits and formidable challenges across diverse industries. While AI promises to revolutionize strategic decision-making, its adoption encounters significant barriers that demand careful management and consideration. Data privacy and security emerge as paramount concerns in sectors dealing with sensitive information, such as banking. Robust encryption, stringent data protection policies, and regulatory compliance are imperative to uphold customer trust and ensure operational integrity. The potential consequences of data breaches underscore the critical importance of safeguarding confidential information against

cyber threats and unauthorized access. Ethical considerations, including algorithmic bias and transparency, pose additional challenges. The inherent risk of biases embedded within AI algorithms could perpetuate discrimination or unfair outcomes, necessitating proactive measures to detect and mitigate biases through regular audits and the use of diverse datasets. Integration challenges often hinder the seamless adoption of AI into existing systems. Complex legacy infrastructures may lack compatibility with AI technologies, necessitating careful planning and comprehensive training for successful implementation. Modular AI systems and incremental deployment strategies emerge as essential tactics to ease integration complexities and minimize disruptions to ongoing operations. Cross-functional collaboration and stakeholder engagement are pivotal in ensuring alignment with organizational objectives and garnering support for AI initiatives.

Moreover, the shortage of skilled AI talent presents a significant barrier to adoption. Organizations face challenges in recruiting and retaining professionals with expertise in AI development, deployment, and management. Comprehensive training programs are indispensable for equipping employees with the requisite skills to navigate AI technologies effectively. By fostering a culture of continuous learning and adaptation, organizations can empower employees to leverage AI tools to their fullest potential.

Furthermore, the complexity of regulatory frameworks governing AI implementation poses a formidable challenge. Navigating disparate regulations and ensuring compliance with evolving legal requirements demand significant resources and expertise. Organizations must stay abreast of regulatory developments and proactively adapt their AI strategies to align with emerging standards and guidelines. In conclusion, while AI holds immense promise in enhancing strategic decision-making and driving operational efficiency, its adoption is accompanied by formidable barriers and challenges. Addressing these challenges requires a multifaceted approach encompassing robust data privacy measures, ethical frameworks, careful integration planning, comprehensive training, and proactive compliance with regulatory requirements. By overcoming these obstacles, organizations can unlock the transformative potential of AI and pave the way for sustainable growth and competitive advantage in an increasingly AI-driven landscape.

Operational Impact

As for the operational challenges and barriers, despite these advantages, AI's operational implementation presents several challenges and barriers. Data privacy and security are among the

most pressing concerns, especially in industries dealing with sensitive customer information like banking. As Ghandour notes, robust encryption and strict data protection policies are essential to maintain compliance and protect customer data. To mitigate these risks, organizations must ensure compliance with data protection regulations and implement industry-standard security measures, such as end-to-end encryption and multi-factor authentication. Ethical considerations, particularly regarding algorithmic bias and transparency, pose additional challenges.

Wilson and van der Velden's "Sustainable AI" emphasizes the need for transparency in AI systems, recommending regular audits to detect and correct biases. To ensure fair and ethical AI practices, organizations should promote cross-functional collaboration and use diverse datasets, reducing the risk of unintended discrimination or biased outcomes in operational processes. Integration challenges often arise when introducing AI into existing systems, requiring careful planning and comprehensive training. Oger et al. suggest that modular AI systems and incremental implementation are key to easing the integration process. By allowing employees time to adapt and provide feedback, organizations can ensure a smoother transition and reduce resistance to change. Comprehensive training is also crucial for equipping employees with the skills necessary to work with AI technologies, fostering a culture of continuous learning and adaptation.

CONCLUSION

Between 2015 and 2024, the literature on Artificial Intelligence (AI) in strategic and operational decision-making has seen significant advancements, with key themes emerging from the adoption of AI across various industries. Notable trends include a growing focus on AI's role in enhancing business processes, optimizing operations, and contributing to sustainable development. The exploration of academic publications during this decade demonstrates that AI can drive innovation and efficiency while presenting unique challenges that need careful consideration. Regarding the limitations of the study, one notable limitation identified in the literature review on Artificial Intelligence (AI) in operational and strategic decision-making is the uneven geographical distribution of research.

Most studies are concentrated in Europe, North America, and Asia, indicating that certain regions may not have the same level of access to AI technology, expertise, or funding. This imbalance can lead to a lack of representation and diversity in AI applications, potentially affecting the generalizability of results. Additionally, the literature highlights issues with integrating AI into existing systems, suggesting that many organizations struggle with technical and cultural barriers. Ethical considerations, such as algorithmic bias and data privacy, are also recurring themes, pointing to the need for stronger regulatory frameworks and ethical guidelines. The lack of a standardized approach to addressing these issues may lead to inconsistent outcomes across different industries and geographical regions. Moreover, the literature often emphasizes successful case studies without thoroughly exploring the failures or unintended consequences of AI implementation, potentially leading to an overly optimistic view of AI's impact on strategic and operational decision-making.

As for suggestions for future investigations, to address the limitations mentioned, future investigations into AI in operational and strategic decision-making should consider expanding the geographical scope of research to include underrepresented regions. This can provide a more comprehensive understanding of AI's impact on a global scale and ensure that diverse cultural and regional perspectives are included. Researchers should also focus on the development of standardized frameworks for integrating AI into existing systems, offering guidelines that can be adapted to various industries and organizational structures. In addition, future studies should delve deeper into the ethical implications of AI, exploring ways to mitigate algorithmic bias and enhance data privacy protections. Conducting longitudinal studies that track the long-term outcomes of AI implementation in strategic and operational contexts could offer valuable

insights into the sustainability and adaptability of AI-driven solutions. Collaboration between academia, industry, and government agencies can foster an interdisciplinary approach to AI research, promoting innovation while ensuring that ethical considerations remain at the forefront of AI development. Lastly, a more balanced examination of both successful and unsuccessful case studies would provide a realistic perspective on AI's role in strategic and operational decision-making, offering valuable lessons for future applications.

The integration of AI into strategic and operational decision-making is evident across case studies, which illustrate both benefits and drawbacks. In "Artificial intelligence in sustainable energy industry: Status Quo, challenges, and opportunities," Ahmad et al. show how AI helps optimize energy production and consumption, aligning with sustainability goals. Similarly, "Strategic Supply Chain Planning and Risk Management" by Oger et al. reveals AI's role in streamlining supply chains, enhancing efficiency, and improving risk management. The capacity for AI to process large datasets and make data-driven decisions is further highlighted in "Artificial intelligence (AI) in strategic marketing decision-making" by Stone et al., where AI transforms marketing strategies to create personalized customer experiences. The strategic and operational impact of AI is expected to continue growing, with ongoing research and development leading to further advancements in the coming years.

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ANNEXES

Annex A – Article Selection

Authors	Document title	Year	Citations	Document Type
Hu, K.-H., Chen, F.-H., Hsu, M.-F., Tzeng, G.-H.	Governance of artificial intelligence applications in a business audit via a fusion fuzzy multiple rule-based decision-making model	2023	5	Article
Agrawal, R., Wankhede, V.A., Kumar, A., Luthra, S.	A systematic and network-based analysis of data-driven quality management in supply chains and proposed future research directions	2023	7	Article
Wilson, C., van der Velden, M.	Sustainable AI: An integrated model to guide public sector decision-making	2022	29	Article
Ahmad, T., Zhang, D., Huang, C., (...), Song, Y., Chen, H.	Artificial intelligence in sustainable energy industry: Status Quo, challenges and opportunities	2021	293	Article
Ghandour, A.	Opportunities and Challenges of Artificial Intelligence in Banking: Systematic Literature Review	2021	9	Article
Stone, M., Aravopoulou, E., Ekinci, Y., (...), Machtynger, J., Machtynger, L.	Artificial intelligence (AI) in strategic marketing decision-making: a research agenda	2020	79	Article
Qaiser, F.H., Ahmed, K., Sykora, M., Choudhary, A., Simpson, M.	Decision support systems for sustainable logistics: A review & bibliometric analysis	2017	52	Article

Charles, A., Lauras, M., Van Wassenhove, L.N., Dupont, L.	Designing an efficient humanitarian supply network	2016	86	Article
Andres, B., Poler, R.	A decision support system for the collaborative selection of strategies in enterprise networks	2016	23	Article