Generative AI for Industry Transformation: A Systematic Review of ChatGPT's Capabilities and Integration Challenges

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Abstract

The rapid advancement of Generative Artificial Intelligence (GAI), particularly OpenAI's ChatGPT, has significantly transformed various industries by enhancing efficiency, reducing operational costs, and fostering innovation. This systematic review explores the applications and integration challenges of ChatGPT across six key sectors: tourism and travel, banking and finance, construction, software solutions, supply chain and transportation, and digital marketing and social media. The findings demonstrate ChatGPT's versatility, ranging from enhancing project management and automating customer support to assisting with code development, route optimization, and marketing strategy. Data protection, system integration, and worker adaption are some of the obstacles preventing its widespread implementation, despite its revolutionary potential. An overview of ChatGPT's alignment with Industry 5.0 objectives of sustainability and human-centric innovation is given in this paper, along with helpful suggestions for removing integration obstacles. By addressing the gaps in existing research, the review lays the groundwork for future investigations into the strategic dissemination of GAI technology across industries.

Keywords:
ChatGPT, generative AI, Industry 4.0, Industry 5.0, operational efficiency, customer satisfaction, sustainability, smart industry.

1. Introduction

Artificial intelligence's quick and continuing advancement, particularly generative artificial intelligence (GAI), has significantly changed many fields. This shift is driven by ChatGPT, a modern AI model by OpenAI, which can address a range of corporate tasks, enhance customer relations, and reduce operational costs to a considerable extent [1]. This research explores the transformative capabilities of ChatGPT as a form of Genrative GAI technology by examining their applications across six key industries: (1) tourism and travel, (2) banking and finance, (3) construction, (4) software solutions, (5) supply chain, and transportation, as well as (6) digital marketing and social media.

Many organizations have integrated AI solutions in compartmentalized domains, sectors such as tourism and travel, banking, construction, software solutions, supply chains, and digital marketing are adopting ChatGPT to revolutionize customer service, streamline workflows, and optimize decision-making processes focusing onl on specific use cases like chatbots or analytic models. However, scientific analysis of GAI capabilities to transform key business processes in multiple sectors remains under researched [3]. Current studies often focus on the broad applications of AI but lack industry-specific insights into how ChatGPT can address operational challenges unique to each sector. For instance, while there is considerable literature on AI's role in automating customer service, detailed analyses of how ChatGPT enhances specific tasks like trip planning, banking fraud detection, or construction scheduling are limited [4, 5]. Similarly, the implications of ChatGPT for resource-intensive processes such as

inventory management in supply chains or content creation in digital marketing remain underexplored. Existing research seldom evaluates the economic and operational trade-offs businesses face when implementing ChatGPT, particularly in industries with complex regulatory frameworks, such as banking and transportation. However, despite these advancements, research on the integration of ChatGPT in these industries remains fragmented, with significant gaps in understanding its full potential and limitations [2]. Additionally, there is a lacuna in comprehensive research on how ChatGPT increases data-driven decision-making, predictive analytics, and cost savings compared to traditional methods. Other challenges, like issues related to data privacy, system compatibility, and adapting the workforce, are known but not explored in detail, hence presenting barriers to successful implementation [8, 9].

This study aims to address these gaps by investigating specific applications of ChatGPT across diverse industries. It delves into how ChatGPT can enhance operational efficiency in tourism, reduce costs in banking, optimize project planning in construction, facilitate coding and collaboration in software solutions, and transform digital marketing strategies. Furthermore, it explores the challenges and opportunities associated with integrating ChatGPT, such as ethical concerns, workforce displacement, and scalability, providing a nuanced understanding of its impact on business operations [6]. By addressing these under-researched areas, this study seeks to contribute to a more comprehensive framework for leveraging ChatGPT in industry-specific contexts [7, 8].

1.2. Survey Structure

This survey is organized into six key sections (Figure 1) to systematically explore the applications of ChatGPT across industries. Section 2: Literature Review, which discusses advancements in ChatGPT-4o and its categorization within Industry 4.0 and Industry 5.0 frameworks. Section 3: Methodology outlines the systematic literature review (SLR) approach, including data collection, inclusion and exclusion criteria, and research questions. Section 4 presents findings and results on ChatGPT's applications, benefits, and challenges across the six industries. Section 5 shows the discussion of the results. Finally, Section 6 provides the conclusion summarises key insights and proposes areas for future exploration.
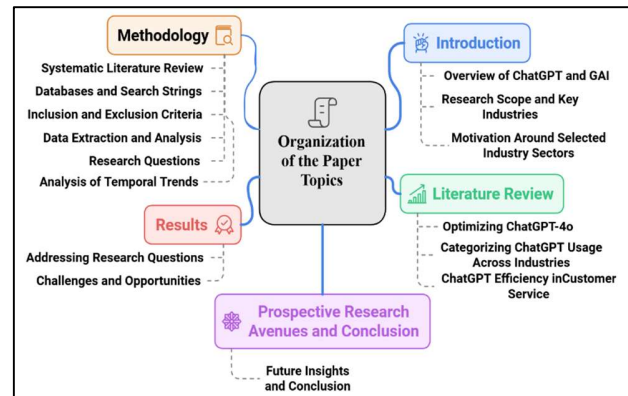

Figure 1: Structure of the paper

1.3 Motivation around selected industry sectors

The motivation for this research stems from the growing recognition of AI as a transformative force in modern industries. As companies increasingly adopt GAI, such as ChatGPT, to improve operations and enhance customer experiences, it is important to understand how it can be strategically leveraged to achieve broader business objectives, including sustainability and cost reduction.

The integration of ChatGPT in industries like tourism, banking, construction, software solutions, supply chains, digital marketing, and social media offers clearer advantages with fewer critical risks. Unlike other industries such as healthcare or education, ChatGPT may not be ideal at this stage. For example, the healthcare sector demands exceptionally high standards for accuracy, especially when dealing with diagnoses, medical advice, and patient safety [9]. Furthermore, healthcare is a highly human-centered field, where empathy, nuanced understanding, and patient-provider relationships are crucial to effective treatment and care. Misdiagnosis and inappropriate treatment suggestions pose severe risks, making healthcare an unsuitable industry for fully integrating AI chat models like ChatGPT [10, 11]. Similarly, studies of [12, 13] have raised concerns in the education industry that ChatGPT could encourage shortcut learning, leading to a diminished focus on genuine knowledge acquisition. This clearly negates various key areas of learning that offer primary importance to innovation and inventiveness. Therefore, these industries require more interactive and creative elements, including human touch and a level of precision that ChatGPT models cannot provide in their present form. Nonetheless, all sectors

under the Industry 5.0 paradigm are different, with factors that define how they can incorporate the use of AI tools like ChatGPT. For instance, the manufacturing industry's challenges might align with maintenance prediction and automation of manufacturing processes. In contrast, the Healthcare industry's key issues might be centered on patient-related data analytics and diagnosis support.

1.4 Contributions

This work furthers the knowledge of generative AI, a conversation on where ChatGPT fits into the context of potential applications in various industries. The contributions of this paper are as follow:
Explores the role of ChatGPT in various industries and its potential applications. Provides insights into how ChatGPT is suitable for various sectors like tourism, banking, and digital selling.

Highlights how ChatGPT creates real-time, personalized services that enhance customer satisfaction, crucial for customer-focused industries. Discusses how ChatGPT can be used in promoting sustainability through minimizing inputs by the companies in the construction sector as well as the supply chain.

Provides valuable recommendations for understanding the impact of ChatGPT and its potential advantages for industries.

This work provides useful recommendations for managers and decision-makers from various industries to estimate the possibilities of ChatGPT for their objectives. Thus, it demonstrates a way towards intersectoral synergy. In addition, this research focuses on the availability of individual, immediate service from ChatGPT that improves customer experience and its applicability in creating awareness to support larger organisational goals of sustainability. Thus, these results may be considered as a base that laid on a small industrial pragmatism of ChatGPT integration into new economic initiatives for optimization and growth.

2. Literature Review and Conceptual Background

This paper brings out the conceptual background of the study and presents a review of the literature on the subject. Several papers have been published in recent years investigating the implementation of AI in organizations, and more recent research has demonstrated the possibility of elevating operational performance with the help of GAI, such as the ChatGPT tool, for cutting costs and improving customer experience. The subsection below presents the literature review and background of this study.

2.1 Optimizing ChatGPT-4o: Enhancements Compared to GPT-3 and 4

ChatGPT3, ChatGPT-4, and ChatGPT-4o all are rooted in the same base architecture, and they are all based on the OpenAI's Generative Pretrained Transformer (GPT) that utilises self-attention for sequence processing. The OpenAI released the GPT-4 Technical Report in 2023 by [14]. It also shows that GPT-4 is as accurate as humans in the majority of accuracy tests, such as being mimicked into a fake bar exam and passing the exam in the highest percentile of participants. On the other hand, ChatGPT-4o is an improved form of the GPT-4 model that is optimized with less memory and computational requirements, which makes it suitable for use [15]. This model is optimised for a particular application or scenario, and there are so many techniques, such as Knowledge distillation, Quantization, or pruning, used to retain the performance and incoming downscale its computational requirements. Nevertheless, both models are useful when used appropriately; however, ChatGPT4o seems to have characteristics that will make users pay a subscription fee. Table 1, shown below, shows the comparison of the features of the GPT series and the evolution from ChatGPT-3 to ChatGPT-4 [16].

Table 1: A Comparison and key features of ChatGPT.

GPT	Released date	Model parameters	Context window	Learning target	Key use case	Size	Dataset
Gpt-1	2018	117 million	512 tokens	Unsupervised learning	Text Generation and Short-Form Content Creation.	5 GB	Books corpus
Gpt-2	2019	1.5 billion	1024 tokens	Multi-task learning		40 GB	Webtext data
Gpt-3	2020	175 billion	2048 tokens	In-context learning	Code Generation and debugging. Question Answering. Language Transfer.	45 TB	Common Crawl, WebText2, Books 1, Books 2, Wikipedia
Gpt-4	2023	trillions of parameters	8195 tokens	Multimodal learning	Advanced Text Generation. Language Understanding and Comprehension. Content Curation and Summarization. Conversational Agents and Virtual Assistants.	570 GB	Books Webtexts Wikipedia Articles, other internet-based writing

2.2 Categorizing ChatGPT Usage Across Industries: Industry 4.0 vs. Industry 5.0

The work of [17] aims to define the essential use cases of ChatGPT in the context of Industry 4.0. However, although this objective is important, it does not include a specific sector-by-sector analysis of the ways in which ChatGPT can be deployed across major primary industries. As such, every industry has areas of operation where technologies like ChatGPT can add value greatly. Thus, the work of [18] aims to establish the relevance of the integration of ChatGPT into Industry 5.0 and examine the characteristics of features connected with it. However, this objective is not oriented by the sector. The use of GAI and ChatGPT varies across industries, aligning them with either Industry 4.0's focus on automation and digitalization or Industry 5.0's emphasis on human-centric collaboration and sustainability. In the banking industry, GAI tools like ChatGPT automate customer service, fraud detection, and data analytics, driving operational efficiency and aligning with the principles of Industry 4.0 [19]. Similarly, the supply chains and transportation industry leverages GAI for inventory tracking, route optimization, and logistics planning, showcasing the core Industry 4.0 goals of automation and process improvement [20, 21]. The digital marketing and social media industry also fits within Industry 4.0, as GAI enhances content creation, advertising, and data-driven strategies, maximizing business outcomes through technology [22, 23].
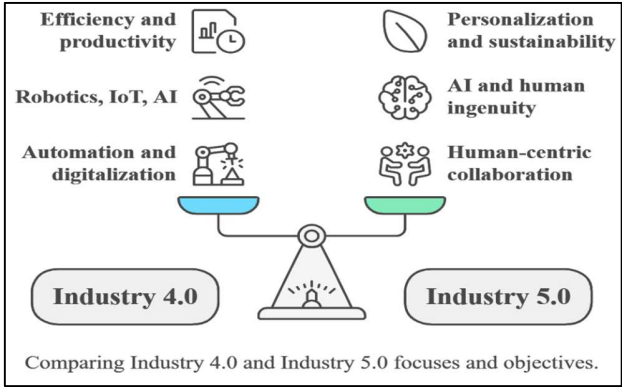

Figure 2: Comparing Industry 4.0 and Industry 5.0 focuses and objectives.

Conversely, industries like tourism and travel align with Industry 5.0, where AI creates personalised customer experiences, overcomes language barriers, and optimizes sustainable practices [7, 8]. This industry exemplifies Industry 5.0 focus on human-centric experiences and co-creation. AI tools like ChatGPT enable predictive analysis, timeline

generation, and sustainable project management in the construction industry, fostering human-machine collaboration and supporting Industry 5.0's focus on sustainability and efficiency [24]. Lastly, the software solutions industry also aligns with Industry 5.0, as it drives the development of AI systems that support human creativity, adaptability, and personalised solutions, underscoring the importance of human-centric technology integration, as it supplies the tools that not only automate processes but also align with ethical, creative, and sustainable goals [4, 5]. Table 2 presents the categorization of the industries based on their alignment with either Industry 4.0 or Industry 5.0 in terms of ChatGPT usage, along with the categorization of the industries based on their alignment with either Industry 4.0 or Industry 5.0 in terms of ChatGPT usage, along with an explanation.
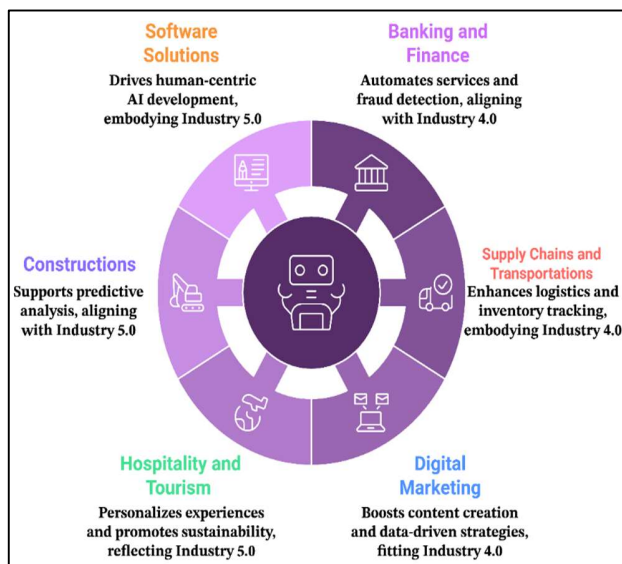

Figure 3: Industry Alignment with GAI

Industry	Category	Explanation	Ref.
Banking Industry	Industry 4.0	Focuses on automation, digitization, and data-driven processes like online banking, AI-based fraud detection, and blockchain. Relies on automation to drive operational efficiency.	[19]
Supply Chains and Transportation	Industry 4.0	Integrates IoT, AI, and robotics for inventory management, logistics, and route optimization, focusing on operational efficiency and data-driven decision-making,	[20, 21]
		key aspects of industry 4.0.	
Digital Marketing and Social Media	Industry 4.0	Focuses on hyper-personalization and ethical marketing using AI to complement human creativity, aiming to enhance customer engagement and create personalised , human-centric solutions.	[22, 23]
Software Solutions Industry	Industry 5.0	Utilises automation, cloud computing, AI, and machine learning to optimize operations, reflecting Industry 4.0's emphasis on productivity, efficiency, and streamlining workflows.	[4, 5]
Tourism and Travel Industries	Industry 5.0	Emphasizes human-centric innovation, personalization, and sustainability, where AI collaborates with humans to enhance customer experience and promote eco-friendly practices.	[7, 8]
Construction Industry	Industry 5.0	Industry 5.0 encourages human-AI collaboration for smart, sustainable projects. Construction integrates automation and AI-driven planning with a focus on sustainability and customization.	[24]

Table 2: Categorization of Industries by ChatGPT Usage in Industry 4.0 vs. Industry 5.0

3. Methodology

3.1 Systematic Literature Review (SLR)

Tranfield et al.[30] emphasized that conducting a review study is fundamental to any research undertaking, particularly when developing a knowledge foundation through the systematic analysis of relevant literature, thereby supporting the effective digital transformation of businesses. Accordingly, this study adopts a Systematic Literature Review (SLR) approach to examine how ChatGPT as a form of GAI can enhance operational efficiency, improve customer satisfaction, and contribute to sustainability across various sectors, including tourism, banking, and finance, construction, software solutions, supply chains and transportation, and digital marketing. The methodology follows the guidelines outlined by

Kitchenham's approach [31], which is widely recognized for conducting systematic reviews in software engineering and technology-related fields.

3.2 Databases and Search Strings

A comprehensive review of peer-reviewed articles, conference papers, and industry reports was conducted using databases such as Scopus, Google Scholar, and Web of Science. The search focused on publications released between December 2022 and late November 2024. Specific search strings were used to identify relevant literature, incorporating terms such as "ChatGPT," "Industries," "operational efficiency," "Cost reduction," "customer satisfaction," "automation," and sector-specific terms (e.g., "tourism automation" and "banking operational efficiency"). This helped in filtering the relevant papers from broader GAI-focused research. Boolean expressions connect keywords for data retrieval. The Boolean Operators enhance or refine search queries by utilising the terms AND and OR [32]. The following Table 3 depicts search strings with the Booleans were utilised to capture relevant studies.

Table 3: Search strings.

No	Batch1 =B1	Batch2 =B2	Combination of strings
1	ChatGPT	Tourism and travel industries	(1, B1) AND (1, B2)
2	GAI	Banking and finance industry	(1, B1) AND (2, B2)
3		Constructions Industry	(1, B1) AND (3, B2)
4		Software solutions industry	(1, B1) AND (4, B2)
5		Supply chains and transportation industry	(1, B1) AND (5, B2)
6		Digital marketing and social media industry	(1, B1) AND (6, B2)

3.3 Inclusion and Exclusion Criteria

In a Systematic Literature Review (SLR), issues of relevance and quality are regulated by the rules and criteria for inclusion or exclusion [33]. It helps in identifying the relevant and good quality of the studies, minimizes the bias, and clears the replication [34]. To ensure the application of academic research, the sample consisted of only papers and articles from the last two years, conference papers, literature sources, including website content, blogs, and genuine, real-life reports written in English. Further, Quality Assessment and Evaluation QAEs that analyzed the application of ChatGPT and other GAI in industries like tourism, banking, construction, software solutions, supply chain, and transportation were considered. Preprints, books,

internal reports, theses/dissertations, essays and papers written in languages other than English were excluded based on the following exclusion criteria.
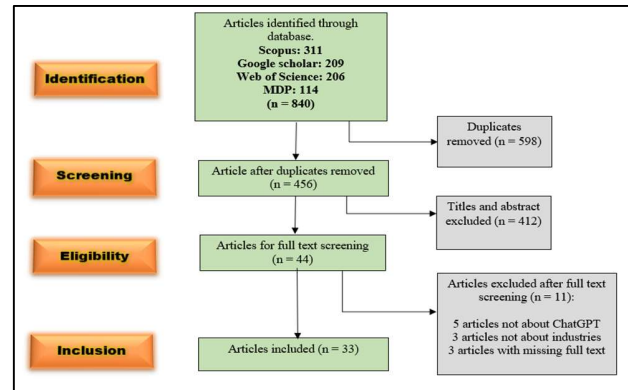

Figure 4: The PRISMA flow diagram of the study.

3.4 Data Extraction and Analysis

For the identification of the articles, this study adheres to the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [35]. The PRISMA flow diagram (Figure 3) is used to identify the number of papers considered for the two stages or screen and the number of papers that were considered for the final analysis. Four main steps were identified in the process as follows:

Identification: 840 records were found through database searches.

Screening: 456 studies were screened based on inclusion/exclusion criteria.

Eligibility: 44 articles were assessed for relevance.

Inclusion: 33 studies were selected for final analysis.

3.5 Research Questions:

The primary objective of this review was to uncover the various applications of ChatGPT across different fields and to gain insights into the existing challenges and opportunities. We have formulated the subsequent research questions in Table 4 and aim to address them through this systematic literature review (SLR).

Table 4: Research questions of the study

RQ1: How can businesses in sectors such as tourism and travel, banking, construction, software solutions, supply chains and transportation, and digital marketing and social media use ChatGPT to streamline operations, automate processes, and reduce costs?			
R.Q. No	Categories /Industry	Specific Research Questions	Aim

RQ 1.1	Hospitality and tourism industry	How can ChatGPT assist travel agencies, airlines, and hotels in automating customer service, trip planning, and booking systems to streamline operations?	Investigating how ChatGPT is employed in automating customer service, trip planning, and booking systems, leading to enhanced operational efficiency.
RQ 1.2	Banking and finance industry	How can ChatGPT automate routine banking processes, such as customer support, fraud detection, and financial advice, to reduce operational costs?	Analyzing ChatGPT's role in automating routine banking processes such as customer inquiries, fraud detection, and financial advice, focusing on cost reduction.
RQ 1.3	Construction Industry	How can ChatGPT streamline the construction planning process, including material sourcing and timeline optimization, to reduce costs and improve efficiency?	Exploring how ChatGPT contributes to automating project management, resource allocation, and data-driven decision-making to optimize operations.
RQ 1.4	Software solutions industry	How does ChatGPT enhance coding, debugging, and software development collaboration in the software solutions industry?	Investigating how software companies use ChatGPT for automated coding assistance, client interaction, and ticket management, resulting in faster development cycles.
RQ 1.5	Supply Chains and Transportations industries	How can integrating ChatGPT into the supply chain and transportation industries optimize inventory management, enhance route efficiency, and improve driver safety?	Assessing how ChatGPT optimizes supply chain operations, such as inventory tracking and route optimization, to minimize operational costs.
RQ 1.6	Digital Marketing	How can ChatGPT be utilised to transform digital marketing, particularly in content creation, digital advertising, marketing strategy, and Email Marketing?	Studying how ChatGPT automates content creation, market research, and customer interaction to streamline marketing campaigns and reduce costs.
RQ2:		what are the challenges and opportunities of integrating ChatGPT in these industries	Analyzing and identifying the integration of ChatGPT across industries along with challenges and opportunities.

Table 5 below shows the included studies and their publication Year, domain, and key findings. The publications were grouped into six categories based on their focus: (1) the hospitality and tourism industry, (2) the banking and finance industry, (3) the construction industry, (4) the Software solutions industry, (5) the supply chain and transportation industry, (6) the digital marketing industry. This distribution of research demonstrates a broadening exploration of ChatGPT across various sectors, each harnessing its capabilities to address sector-specific opportunities and challenges.

Table 5: Summary of Included Studies on ChatGPT Applications Across Industries.

No	Year	Categories /Industry	Key Findings and Implications	Ref.
	2024		The study reveals that the integration of generative AI (GAI) technologies, such as ChatGPT, is set to substantially transform the hospitality and tourism industry. Additionally, it explores the potential challenges associated with this integration, taking into account the perspectives of businesses, customers, and regulatory bodies.	[7]
	2024		The study proposed various prospective applications of ChatGPT within the hotel industry. The study's recommendations are based on prior research on ChatGPT and an analysis of relevant literature on the subject.	[36]
	2024		The study provides a balanced view of ChatGPT's applications in tourism, including customer service automation, personalised marketing, and virtual tour guides. It also highlights risks such as data privacy concerns, misinformation, and over-reliance on AI, which may reduce the human elements crucial to tourism services.	[6]
	2024	Hospitality and tourism industry	An online survey of 536 respondents assessed tourists' perceptions of using ChatGPT. The analysis revealed that tourists express concerns about risks such as privacy, accuracy, and overreliance when utilising ChatGPT for tourism information. These risks were found to influence tourists' attitudes and intentions toward using ChatGPT.	[37]
	2023		The study emphasizes ChatGPT's potential to process user inquiries and provide personalised recommendations. It demonstrates how ChatGPT can deliver detailed, real-time information to travelers, facilitating enhanced planning and decision-making.	[38]
	2023		The qualitative study involved 27 participants primarily from the travel and tourism sector. The participants highlighted that ChatGPT offers significant advantages for tourism businesses and their customers, including language translation, enhanced communication, seamless text generation, and comprehensive responses.	[39]
	2023		The article focused on the application of ChatGPT in the creation and delivery of hospitality and tourism experiences, providing extensive examination of the advantages and potential challenges and risks posed by (GPTs) to the hospitality and tourism sector.	[40]

Year	Industry	Description	Ref
2024	Banking and finance industry	The study explored the potential applications and challenges of ChatGPT in the financial and accounting domain. It highlights how ChatGPT could transform various accounting processes by automating repetitive tasks, enhancing financial and managerial reporting and analysis, improving auditing and tax practices, and streamlining client interactions.	[41]
2024		The paper compares Gemini and ChatGPT in finance and accounting tasks, highlighting differences in their attributes and performance. It concludes that ChatGPT excels in automating data extraction, executing calculations, and providing preliminary insights, effectively supporting decision-making through a conversational interface for in-depth analysis.	[42]
2024		The study examines the ethical dilemmas related to the use of ChatGPT in finance, addressing issues such as biased outcomes, the incorporation of false information in financial decision-making, privacy and security concerns, and deficiencies in transparency and accountability within decision-making processes and financial services.	[43]
2023		The article explored the applications of ChatGPT in finance, revealing that it is a powerful tool for assessing bankruptcy risk. It highlights its potential as a digital advisor in addressing financial management challenges, including data shortages and adversarial examples, while also speculating on the future role of ChatGPT within the financial sector.	[44]
2023		The study presents practical examples demonstrating GPT-4's effectiveness in sentiment analysis, ESG analysis, corporate culture analysis, and Federal Reserve opinion analysis. It also offers instructive recommendations for applying GPT-4 in these areas.	[45]
2024	Constructions Industry	The study investigates ChatGPT's capabilities in construction project risk management in comparison to human experts. It contrasts the performance of 16 experts from Finnish construction companies with that of ChatGPT through peer reviews. Results indicate that ChatGPT outperforms human experts in generating risk management plans, achieving significantly higher quantitative scores.	[46]
2023		The author conducted an experiment involving a simple construction project, where participants found that ChatGPT generated logical schedules aligned with the project scope. Overall, users reported positive experiences and recognized the potential for automating tasks. The study underscores ChatGPT's effectiveness in creating schedules for straightforward projects.	[47]
2023		The findings indicate that ChatGPT demonstrates a moderate level of performance in risk management, providing more accurate knowledge in risk response and risk monitoring than in risk identification and analysis subprocesses.	[48]
2023		The article offered a comprehensive review of current literature on ChatGPT's applications in the construction industry, highlighting its potential to transform various resource-intensive project tasks while also addressing associated cybersecurity risks. Identified concerns are analyzed within the context of construction-specific applications.	[49]
2024	Software solutions industry	The study provided unique perspective on ChatGPT's potential to transform software requirements engineering practices, presenting strategic approaches for leveraging ChatGPT to enhance this process efficiently. It examines ChatGPT's effectiveness in requirements engineering alongside prompt engineering techniques.	[50]
2023		The paper explored ChatGPT's role in assisting with debugging, bug prediction, and bug explanation for programming issues. It also highlighted the importance of supplementary debugging tools to verify its predictions. The paper recommends incorporating ChatGPT into a comprehensive debugging toolkit, for more effective bug resolution..	[51]
2023		The study explored the potential of GAI technology, emphasizing the ChatGPT API as a valuable tool in software development that offers intelligent and efficient solutions across a range of applications.	[52]
2023		The study explores ChatGPT's application in software development for architecture-centric professionals (ACSE). Results demonstrated ChatGPT's strong performance in enhancing processes and saving time. The article highlights the significance of ChatGPT in software engineering, particularly in the requirements analysis and testing stages.	[53]
2024	Supply chain and transportations industry	It examines current projects and perceptions of GAI technologies within US and UK supply chains, highlighting a range of initiatives from proof-of-concept to full implementation. The primary focus of these initiatives is on operational improvements, cost reduction, and process efficiency.	[54]
2024		The study identified several challenges in utilising ChatGPT within the supply chain, including its limitations in replacing human expertise, its lack of immediate transformative impact, potential inaccuracies in its outputs, and the time required for the technology to reach full maturity.	[55]
2024		The study examined ChatGPT-3.5's potential to optimize distribution routes and reduce costs through domain-specific calculations. Results demonstrated a substantial reduction in total distance traveled, suggesting that AI-driven route optimization could be a valuable asset in cost-reduction strategies within logistics and supply chain management.	[56]
2024		The article explored ChatGPT's potential as a tool for retail businesses to enhance customer experience and boost sales. It emphasizes the importance of strategic integration to improve client interactions. Additionally, it discusses future opportunities for ChatGPT in retail, such as generating product descriptions and facilitating virtual try-on experiences.	[57]
2023		The study focuses on the tuna fish supply chain in the USA, examining end-to-end operations and data handling methods. The result reveals that ChatGPT can streamline customer service in logistics by answering common queries, provide real-time updates on stock levels, and suggest optimal delivery routes.	[58]

Year	Domain	Description	Ref
2023		It examines the benefits, challenges, and trends of adopting ChatGPT in Operations and Supply Chain Management (O&SCM). Data from 154 UK and 161 US practitioners reveal that adopters experienced notable improvements in operational efficiency, while non-adopters recognized its potential advantages.	[59]
2023		Results showed that ChatGPT can be applied in different areas of SCM (e.g., route optimization, predictive maintenance, order shipment, customer and supplier relationships), with a potential generation of significant benefits such as cost reductions and the improvement of supply chain performance.	[60]
2023		Results found that ChatGPT can identify dangers and take corrective action to keep autonomous cars and robotics safe. It improves autonomous system user interfaces with XR for real-time information transmission. It can also make vehicle systems safer, more efficient, and user-friendly.	[61]
2024		Article reveal that ChatGPT can generate high-quality marketing content, assists in drafting advertising, social media posts, and other promotional materials, ensuring consistency and relevance across platforms. Additionally, it supports the development of personalised marketing strategies by segmenting audiences and customizing messages for specific groups.	[62]
2023		The study addressed how marketers can leverage GAI and ChatGPT to create effective digital advertising campaigns. It examines the influence of these technologies at each stage of campaign development and the evolving role of marketers. The methodology includes secondary data analysis, and an in-depth interview with an advertising agency CEO.	[63]
2023	Digital marketing industry	The study investigated the impact of GAI, specifically ChatGPT, on marketing efficacy within the Instagram platform. The findings indicate that marketing content generated by ChatGPT can capture significant attention and interaction from users, thereby increasing their interest in the company's products or services.	[64]
2023		The study concluded that leveraging ChatGPT to enhance online marketing and promotion for MSMEs presents a promising opportunity to engage new customers, improve customer relations, and optimize marketing efforts effectively.	[65]
2023		The paper concludes that ChatGPT can assist micro, small, and medium enterprises (MSMEs) in improving their online visibility, optimizing marketing initiatives, and developing more effective marketing strategies..	[66]

3.6 Analysis of Research Focus and Temporal Trends

From the table 5 above, the selected study's analysis indicates varied research focus across different domains. Hospitality and tourism accounts for 21.2% of publications (7 papers), followed closely by supply chain and transportation with 24.2% (8 papers). Banking and finance, along with digital marketing, each represent 15.2% (5 papers), while construction and software solutions industries each contribute 12.1% (4 papers). Temporal analysis shows a concentration of research in 2023, with 57.6% (19 publications) compared to 42.4% (14 publications) in 2024 (Figure 6). However, specific

domains, such as Hospitality and Tourism and Banking and Finance, showed growth or maintained steady output, reflecting evolving research interests and priorities within these fields over time. Figure 4 and 5 below illustrate more about the analysis of research focus and temporal trends of selected papers.
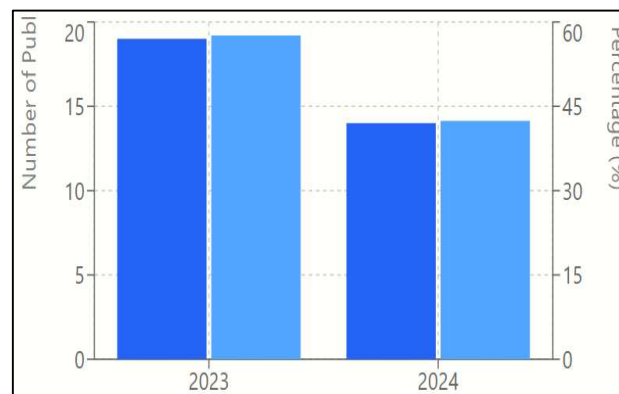
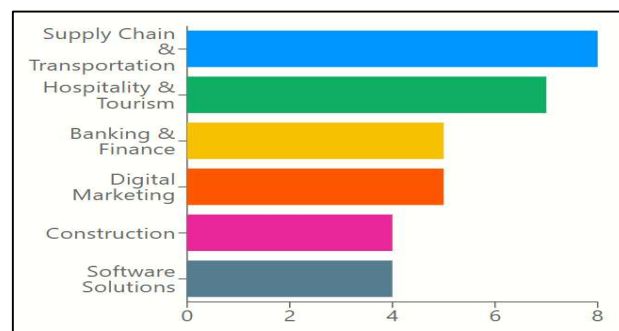**Figure 5**: Publication Distribution by Year (Total = 33)

Figure 6: The distribution of selected publications by domain
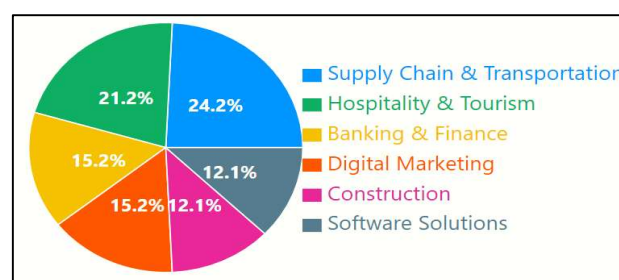
Figure 8: Percentage of selected publications by their domain

4. Results

This research is anchored in two key questions aimed at exploring the multifaceted applications of GAI, such as ChatGPT, across various industries. RQ1 seeks to uncover how businesses in sectors such as tourism, banking, construction, software solutions, supply chains,

transportation, and digital marketing can leverage ChatGPT to streamline operations, automate processes, and reduce costs. This overarching question is further dissected into specific sub-research questions that delve into the unique applications of ChatGPT within each sector. While RQ2 addresses the challenges and opportunities associated with integrating ChatGPT into these sectors, providing a comprehensive understanding of the implications of its adoption. The results highlight both the transformative potential of ChatGPT and the barriers that organizations may encounter in its implementation. The following sections present the results of this research, structured around the key research questions (RQs) outlined earlier.

RQ1.1: How can ChatGPT assist travel agencies, airlines, and hotels automate customer service, trip planning, and booking systems to streamline operations?

The proliferation of GAI in the tourist sector is an additional element warranting broader investigation. For travel agencies, ChatGPT can handle routine inquiries such as questions about travel packages, visa requirements, and itinerary details, enabling faster and more accurate responses to clients [7, 36]. According to [67], 83% of airline customers expect replies to inquiries within 24 hours. With generative GAI chatbots, airlines can deliver real-time responses, reducing response times and meeting customer expectations more effectively. For instance, Expedia Groups employed ChatGPT to answer customer questions about available tours or destination-specific requirements, allowing human agents to focus on more complex tasks [68]. Additionally, all DERTOUR travel agencies, which are European travel agencies, integrated ChatGPT into their system to provide personalised travel plans based on a customer's preferences, which resulted in a significant reduction in planning time and improved customer satisfaction, helping agencies cater to individual needs more efficiently [69].

For airlines, ChatGPT and other GAI can automate processes such as real-time flight bookings, ticket modifications, and check-ins, reducing the strain on call centers [6]. For example, KLM Airlines used ChatGPT-powered chatbots to assist customers with booking flights, modifying tickets, managing special requests like seat upgrades and extra baggage allowances, and checking flight statuses, leading to a 25% decrease in call center traffic [70]. Furthermore, ChatGPT can handle special requests from passengers, such as meal preferences and seating arrangements, streamlining these processes and improving customer experiences [71]. Etihad Airways is also introducing a GAI booking feature through the BOTIM chat app, allowing customers to complete bookings by entering basic travel details. Uniquely, Etihad's GPT model supports both English and Arabic, offering greater accessibility and inclusivity for diverse users [72]. Similarly, Air India has

integrated a ChatGPT-powered chatbot, "Maharaja," into its customer service, which currently includes Hindi, English, French, and German. This GAI chatbot has been extensively trained to manage a wide range of customer inquiries, such as those related to bookings, cancellations, baggage policies, and loyalty programs, contributing to smoother operations and more satisfied passengers [72, 73]. By offering real-time updates and assistance, ChatGPT enhances passengers' travel experiences and provides them with valuable support throughout their journey.
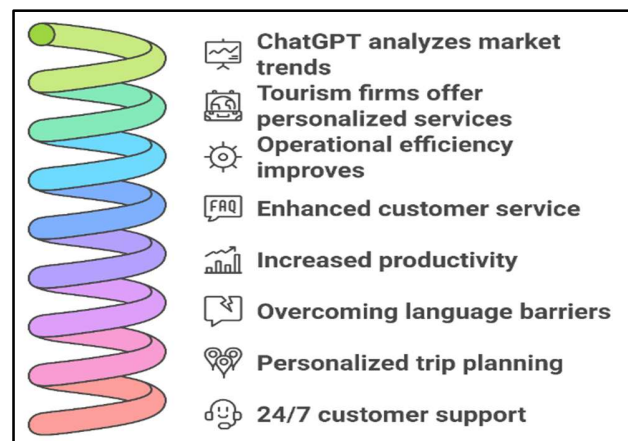

Figure 7: ChatGPT Transforms the Tourism Industry.

As per [40] the hospitality and tourism sector anticipates a significant impact from ChatGPT, driven by evolving consumer preferences and the increasing adoption of diverse tools for personalised service delivery, thereby facilitating enhanced trip planning experiences and boosting customer satisfaction. Hotels can similarly benefit from ChatGPT, particularly in automating check-in/check-out processes and booking management. AI can accurately forecast occupancy rates, enabling hotels to optimize workforce levels and resource allocation [6]. ChatGPT, as a form of GAI, can also enhance booking management by handling inquiries about room availability, amenities, and booking modifications [38]. In the U.S., the Edgewater hotel chain in Arizona successfully integrated ChatGPT into its booking system, with the chatbot managing over 60% of reservations, which allowed staff to focus on delivering high-quality guest services [36]. Moreover, ChatGPT can act as a virtual concierge, offering guests personalised recommendations for local attractions, restaurants, and services [6, 38, 71]. Figure 5 depicts ChatGPT benefits in the tourism industry. At the same time, Table 5 organises the diverse applications of ChatGPT tools in the tourism and hospitality sectors, highlighting the innovative integration points, functional contributions, and measurable outcomes in each domain.

Table 6: Summary of the diverse applications of ChatGPT in the hospitality and tourism industry

Application	Domain	Examples	Key Functions	Benefits	Notable Outcomes
Routine Inquiry Management	Travel Agencies	ChatGPT for travel package queries, visa requirements, and itineraries (Expedia Group)	Manages repetitive inquiries with accurate, fast responses	Enhances client response efficiency	Frees human agents for complex tasks, reducing response times.
Personalised Travel Plans	Travel Agencies	DERTOUR (European agency)	Creates tailored itineraries based on preferences	Reduces planning time and improves satisfaction	Higher efficiency in personalised service delivery.
Real-Time Customer Support	Airlines	ChatGPT-powered response systems (e.g., KLM, Air India)	Handles bookings, ticket modifications, and check-ins	Reduces call center strain.	25% reduction in call traffic at KLM
Multi-language Support	Airlines	Etihad Airways (English and Arabic), Air India ("Maharaja" chatbot in multiple languages)	Supports diverse languages, increasing accessibility	Enhances inclusivity and reaches a broader audience.	Tailored customer support in multiple languages.
Special Requests Management	Airlines	KLM and Air India ChatGPT models	Manages meal, seating, baggage preferences	Improves customer experience with personalised service	Streamlined handling of unique customer needs.
Virtual Concierge	Hotels	Edgewater Hotels (Arizona)	Recommends local attractions, restaurants	Enhances guest experience with tailored suggestions.	Over 60% of reservation management is handled by ChatGPT.
Automated Check-In/Check-Out	Hotels	Multiple implementations across U.S. hotels	Automates entry/exit processes	Reduces manual labor and improves the guest experience.	Staff can focus on quality service instead of routine tasks.
Booking Management	Hotels	ChatGPT for room availability, amenities, modifications	Provides instant booking information	Increases operational efficiency reduces inquiry load	Improved customer satisfaction due to quick responses
Occupancy Forecasting	Hotels	Applied in major hotel chains	Predicts room occupancy and resource needs	Optimizes workforce and resource allocation	Cost savings and improved resource planning

RQ1.2: How can ChatGPT automate routine banking processes, such as customer support, fraud detection, and financial advice, to reduce operational costs?

Can ChatGPT Predict How Stocks Will Perform? The answer is Yes; ChatGPT has demonstrated the potential to predict stock performance, according to finance academics Alejandro Lopez and Tang from the University of Florida [74]. Lopez and Tang's study assessed the efficiency of the model and noted that ChatGPT mainly uses headlines to predict the changes in stock rates. This capability enables the chatbot to trend and even make suggestions based on real-time financial news, making the chatbot potentially helpful for financial analysis and market projection. Besides, Lopez and Tang showed in their experiment that ChatGPT can do the trading on stock prices using headlines as indicators. They analyzed about 40000 headlines that came out from October 2021 to December 2022 containing stock information concerning the New York Stock Exchange, NASDAQ, and American Stock Exchange. In their experiment, they prompted ChatGPT as follows:

"Forget all your previous instructions. Pretend you are a financial expert. You are a financial expert with stock recommendation experience. Answer 'YES' if it is good news, 'NO' if it is bad news, or 'UNKNOWN' if uncertain in the first line. Then elaborate with one short and concise sentence on the next line." Then, expand on it with another brief statement of just one line. ChatGPT was then prompted to decide if each headline was bullish or bearish for a company's stock. Lopez and Tang also discovered that the chatbot could forecast daily stock market performance with statistically significant levels of accuracy and surpass two common sentiment analysis approaches. This implies that ChatGPT can be of great help in analysing the sentiment from news and its implication on stock prices [75].

As pointed out by the author of [39] ChatGPT is one of the (GAI) that has quickly been adopted by the banking industry due to the following factors. Firstly, through the use of ChatGPT, bankers can unravel broad internal-client-related data such as consumption and investing trends. This capability enables the mining of such relevant information, which in turn aids the generation of more efficient solutions tailored for the clients, which results in increased quality of services as well as the creation of better relations with the clients. For instance, Bank of America's Erica is an AI-powered virtual assistant that uses a chatbot technology akin to ChatGPT to help customers search transactions or spend and make bill payments [76].

Upon its deployment, Bank of America noted increased customer satisfaction as the response rates were much higher and specialized by this technology. Secondly, in the context of fraud detection and prevention is rather important because, based on previous consumer behavior patterns that contributed to fraud, ChatGPT can now recognize today's fraud attempts [43]. For example, the American bank with global operations, J.P. Morgan in the USA, used ChatGPT to intensify transactional monitoring and fraud prevention. The firm also uses ChatGPT to study large amounts of transaction data to look for patterns that could lead to increased risk visibility of unusual or suspicious behavior [41]. Additionally, ChatGPT aids J.P. Morgan in generating detailed Suspicious Activity Reports (SAR), which empower the firm to take proactive measures in identifying and mitigating potential fraudulent activities. By providing comprehensive insights and documentation, ChatGPT supports J.P. Morgan's efforts to safeguard customer assets, enhancing both regulatory compliance and financial security [77].

Furthermore, Wealthfront, a financial technology company, has integrated (GAI) into its robo-advisor platform. Utilising algorithms similar to those of ChatGPT, Wealthfront evaluates a user's financial circumstances and subsequently generates a personalised investment portfolio [45, 78]. Table 6 presents the Chatboats found in the literature in various applications in the financial industry, offered by different financial institutions along with the services they provide to customers [43]. By automating interactions between customers and representatives, ChatGPT significantly reduces the time spent on routine tasks, such as responding to basic inquiries or checking account information. This efficiency allows banks to allocate their resources more effectively, directing attention towards more complex inquiries and specialized services [42].

Table 6: Financial institutions' Chatbots and the customer services provided

Virtual Assistant Chatbots	Services Provided	Ref.
HSBC's Amelia	Account management, money transfers, investment advice	[79]
Chase's COiN	Account inquiries, card activation, fraud alerts	[80]
Citi's virtual assistant	Account management, balance inquiries, bill payments	[81]
Bank of America's Erica	Account management, bill payments, budget planning	[82]
Capital One's Eno	Account balance checking, transaction viewing, fraud alerts	[83]
Ally Assist	Account management, bill payments, investment advice	[79]
TD Ameritrade's AI-powered chatbot	Real-time market insights, investment recommendations	[79]
American Express's virtual assistant	Account management, reward tracking, customer service	[79]
Fidelity's virtual assistant	Investment advice, account management, research	[78]
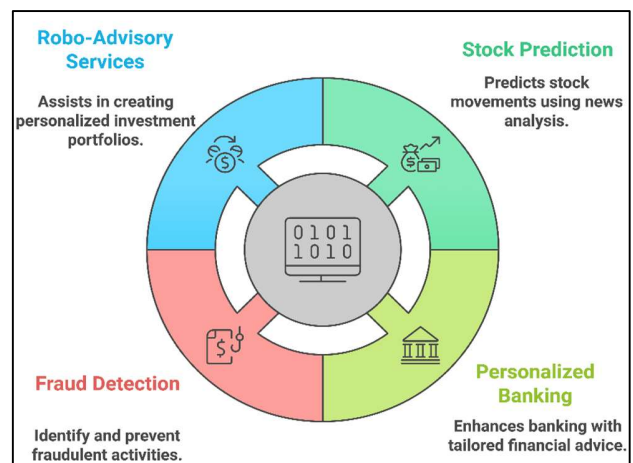
RQ 1.3: How can ChatGPT streamline the construction planning process, including material sourcing and timeline optimization, to reduce costs and improve efficiency?

A construction schedule is a comprehensive plan that delineates the timeline of a construction project [84]. It specifies the tasks to be accomplished, their timelines, and the responsible parties. An effective construction schedule guarantees that all aspects of the project operate efficiently and adhere to deadlines without superfluous delays [84]. The use of ChatGPT, as a form of GAI, in construction scheduling can be seen as a revolution in project management [79]. The work of Prieto et al [47] clearly shows the possibilities of ChatGPT in predicting and reducing the amount of paperwork and manual labor that considerably slows down the work of the construction industry. In integrating the ChatGPT, the study sought to create construction schedules for projects to underscore the elaborative manner in which this tool is practiced in the construction project planning framework. Notably, ChatGPT achieved well-structured and coherent outcomes generating schedules based on an identified project's needs as evidenced in the study.

Civils.ai is a SaaS application company based in Singapore that is designed especially for the civil engineering business leveraging the same tech stack as ChatGPT but optimized for the civil engineering industry. It raises the possibility of converting construction reports and project data into a readable form for the LLM [85]. Civils.ai IT department takes usable soil information and transforms it into mining-like environments that engineers can use for planning and executing necessary calculations on projection scenarios within those constructed MMORPG terrains. To use this tool, users have to input files in the form of PDF documents like site reports, contracts, or design codes into the platform. The software further quarries this information to produce accurate answers to such user queries on peculiar project questions as the remaining amphibian risks which were not captured in the design documents or which particular person is charged with the responsibility of fixing certain components such as pipes or windows in a given project [85].

This multifaceted application of ChatGPT not only optimizes construction scheduling but also significantly improves project efficiency and overall management outcomes. Table 7 below illustrates an example of organizing the process using ChatGPT for construction scheduling, showing each step, its associated action, detailed tasks, and sample prompts where applicable.

Table 7: The construction scheduling process using ChatGPT

Step	Action	Details	Sample Prompt
Step 1: Prompt Creation	Craft a detailed prompt with construction data	Include project scope, tasks, time estimates, dependencies, resource requirements, and milestones	"Create a construction schedule for [Project Name] with the following: - Project scope, task list, time estimates, dependencies, and resources. Generate a timeline with start/end dates."
Step 2: Review Output	Review the generated schedule for accuracy.	Check tasks, timelines, dependencies, and resource allocation. Ensure milestones are realistic.	N/A (No specific prompt needed for review; review the GAI-generated schedule manually)
Step 3: Adjust as Necessary	Modify the schedule to reflect updates and changes	Adjust task durations, add new tasks, update resources, and correct task dependencies as needed	N/A (Manually adjust the schedule as required)
Step 4: Optimize the Schedule	Use advanced features like scenario planning, predictive analysis, and visualizations	Perform scenario planning, simulate delays, implement predictive analysis, and create visual aids like Gantt charts or milestone maps	"Simulate the impact of a 3-day delay in Task 2 on project completion. Suggest adjustments to minimize delay. Create a visual Gantt chart of the schedule."
Step 5: Continuous Updates	Make continuous adjustments and document changes	Modify the schedule as the project progresses. Generate updated schedules, reassign resources, and document changes for compliance	"Modify the construction schedule based on a change in resource availability. Recalculate the timelines and generate updated documentation for the stakeholders."

In addition to that, reference [47, 86] indicated that ChatGPT plays a crucial role both on-site and off-site in construction projects. On-site, it aids in clarifying project requirements, troubleshooting issues, and coordinating schedules. Meanwhile, off-site, it fosters remote collaboration, supports decision-making, and facilitates documentation reviews. It also aids in collaborating with off-site teams and SMEs by evaluating ideas and their feasibility for the project. On the other hand, Xue et al. [87] found that in terms of project coordination, ChatGPT has succeeded in assisting construction companies by analyzing project plans, identifying potential challenges, and offering insights to prevent delays and rework. It also swiftly generates accurate progress reports for status updates, allowing project managers to share key accomplishments, milestones, and estimated timelines. Furthermore, reference [88] found that ChatGPT can assist regarding construction contract issues, provide troubleshooting guidance, and brainstorm potential solutions based on specific project challenges in construction endeavors.

Table 8 summarizes the specific tasks in construction project management that can be automated using ChatGPT, alongside their descriptions, impacts on project outcomes, and practical use cases.

Table 8: construction project tasks automated using ChatGPT

Task	Automation Description	Impact on Project Outcomes	Practical Use Cases
Schedule Generation	Generates initial construction schedules based on project scope, tasks, timelines, dependencies, and resources.	Reduces manual scheduling time, enhances accuracy, and allows quick adjustments.	Creating Gantt charts, critical path method.
Task Prioritization	Analyzes tasks and interdependencies to prioritize activities effectively.	Ensures critical tasks are addressed first, avoiding delays and resource conflicts.	Prioritizing foundation work before framing.
Progress Reporting	Automatically generates progress reports summarizing key accomplishments and milestones.	Saves time for project managers and provides timely insights for stakeholders.	Weekly progress updates for stakeholders.
Risk Assessment	Evaluates project plans to identify potential risks and suggests mitigation strategies.	Early identification helps prevent issues, reducing delays and cost overruns.	Risk management matrices and action plans.
Documentation Generation	Produces essential documentation such as compliance reports, meeting minutes, and specifications from project data.	Ensures accurate records are available, improving compliance and communication.	Generating weekly meeting summaries.
Change Order Management	Assists in processing change orders by analyzing impacts on schedule and budget.	Efficiently integrates changes, minimizing disruptions to the project timeline.	Analyzing cost impacts of design changes.
Communication & Coordination	Facilitates communication by generating responses to common queries from team members and stakeholders.	Improves coordination among teams, enhancing collaboration and reducing misunderstandings.	Automated responses to frequently asked questions.
Data Analysis & Insights	Analyzes historical project data to provide insights on performance trends and areas for improvement.	Data-driven insights help project managers make informed decisions that enhance performance.	Performance reports comparing projects.

RQ 1.4: How does ChatGPT enhance coding, debugging, and software development collaboration in the software solutions industry?

Software engineering is a broad field comprising sub-processes such as software development, designing, testing, coding, etc (Figure 7). ChatGPT has been shown to assist in all these sub-domains of software engineering [51, 89]. Companies can utilise ChatGPT to streamline their software development processes, saving time and resources by leveraging existing knowledge rather than starting from

scratch when coding basic programs; it enhances coding by assisting developers in various ways, which is especially helpful for newcomers to specific programming languages or frameworks [51]. Additionally, ChatGPT can significantly enhance the debugging process by identifying errors, providing troubleshooting guidance, and clarifying code functionality [51]. Quickly cross-referencing documentation saves developers time when searching for information.
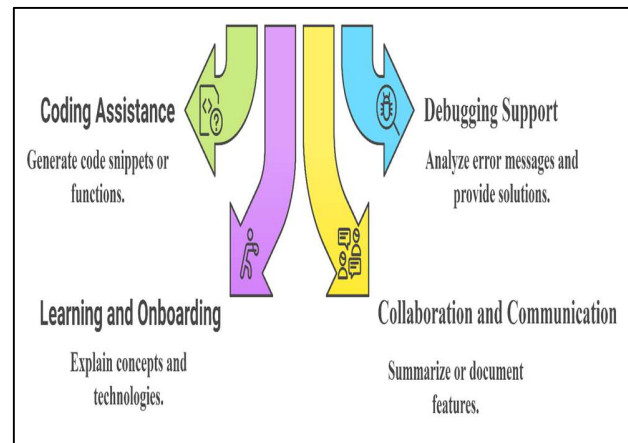
Figure 9: ChatGPT capability in coding, debugging, and software development

Beyond code generation, ChatGPT provides step-by-step troubleshooting recommendations, utilising error messages and surrounding code context to offer detailed guidance. It can explain the function of specific code segments, enabling developers to better understand the underlying causes of bugs [90]. For example, if a developer encounters an issue in their JavaScript code, they can share both the code and error message with ChatGPT, which can clarify how a missing semicolon triggers a syntax error in JavaScript. This assistance empowers developers to promptly address the issue, streamlining the debugging process and reducing development time.

The author provided the prompt: "Write a Python function that takes a list of numbers and returns the sum of all even numbers in the list." ChatGPT responded by generating accurate Python code that fulfilled the requirements, accompanied by a clear explanation of the code's functionality. The output of this interaction is illustrated in Figure 9, demonstrating ChatGPT's capability to deliver precise and comprehensible solutions to programming queries.

According to [52] ChatGPT is capable of reviewing code to identify common syntax, runtime, and logical errors that may result in bugs. For instance, a junior developer could describe a complex algorithm in straightforward terms. ChatGPT would generate the equivalent Python code, allowing the developer to concentrate on integrating it into

the broader project framework. In terms of code generation and bug fixing, Megahed et al. [91] explored its potential in tasks like code explanation, suggesting alternative problem-solving methods, and code translation, with viable solutions. Meanwhile, Treude et al. [92] introduced GPTCOMCARE, a ChatGPT-based prototype aiding programmers in generating multiple solutions for programming problems, highlighting differences between each solution using colors.
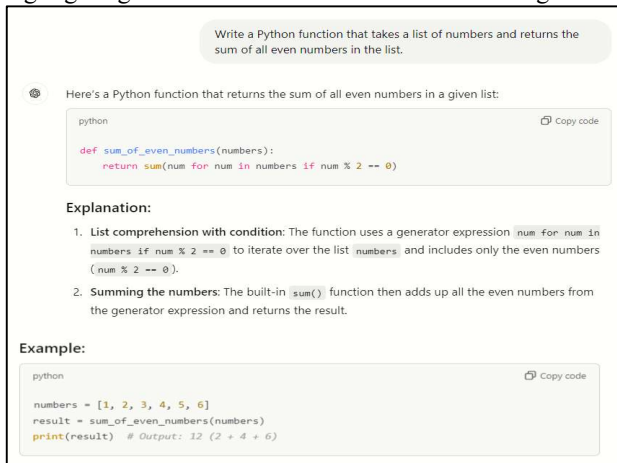

Figure 10: A screenshot of ChatGPT's response to Python code

The potential contributions of ChatGPT in ERP system Life Cycle endeavor were investigated by the study of [92, 95], which revealed that ChatGPT can serve as an excellent guide throughout all stages of the ERP software development life cycle, except for the Implementation & Coding and Testing phases. Nevertheless, an ERP system is a comprehensive software solution crafted to cater to the diverse needs of various departments within a company [93, 94].

In this regard, our investigation indicates that most ChatGPT usage occurred during the implementation phase; however, many users effectively utilised the tool across multiple stages of the software development lifecycle, including process enhancement, requirements generation, and test case creation [50, 90]. During requirement gathering and analysis, ChatGPT suggested structured activities, such as "Identify Stakeholders," "Conduct Interviews," and "Document Requirements." Additionally, questions were strategically formulated for each lifecycle stage and then posed to ChatGPT sequentially. From this, we conclude that embracing a broader, more innovative perspective on the various tasks ChatGPT can support is advantageous. Some participants who found ChatGPT less beneficial faced challenges in identifying relevant use cases, often due to a limited understanding of the tool's capabilities [95, 96]. This underscores the importance of educating users about ChatGPT's potential applications to unlock its full value across the development lifecycle. Table 9 summarizes the primary use cases, prompts, and anticipated responses when employing ChatGPT in software development.

Table 9: Key features, use cases, prompts, and expected responses for ChatGPT in software development.

Aspect	Use Case	Prompt	ChatGPT Response
Coding Assistance	Generating a function for email validation	"Can you provide a JavaScript function to validate an email address?"	function validate Email (email) // Explanation of regex usage
Debugging Support	Analyzing an error message	"I'm getting 'undefined is not an object' in my code. What could be wrong?"	"Check if the object is initialized. Ensure you're accessing properties correctly."
Learning and Onboarding	Understanding REST vs. GraphQL	"What's the difference between REST and GraphQL?"	"REST is resource-oriented, while GraphQL allows clients to request exactly the data they need."
Collaboration and Communication	Documenting a new feature	"Can you summarize the functionality of this module?"	"This module handles user authentication, including login, registration, and password recovery."

RQ1.5: How can integrating ChatGPT into supply chain management and transportation industries optimize inventory management, enhance route efficiency, and improve driver safety.

From streamlining supply chain processes and automating inventory updates to optimizing transportation routes and enhancing traffic safety measures, ChatGPT is a transformative tool for operational excellence. This section explores its applications, benefits, and notable case studies within these critical areas, providing insights into how ChatGPT is reshaping traditional practices and driving innovation.

A. Supply chain

In the realm of Supply Chain Management (SCM), Francisco [60] explores the initial evidence of ChatGPT applications in SCM, suggesting that while this technology may take time to mature and yield significant benefits in SCM, its integration is inevitable and poised to accelerate

rapidly. The author of [60] highlighted ChatGPT's potential to enhance various aspects of SCM, including route optimization, predictive maintenance, customer relationships, and waste reduction, ultimately improving process performance and reducing costs. While Wamba et al. [59] delve into a broader discussion to explore the benefits, threats, and organizational learning dynamics associated with the integration of ChatGPT in SCM, his findings suggest efficiency as a major benefit of ChatGPT adoption in SCM, while security remains a significant concern. Additionally, Rathor [58] focuses specifically on the impact of GAI-based ChatGPT technology on achieving sustainable SCM practices in selected industries, his study highlights the potential of ChatGPT to notify staff about dwindling inventory levels and offer advice on optimizing storage Utilisation based on current stock and future demand projections.

Sphere Partners, a global technology consulting and digital innovation firm, is a compelling example of how the integration of ChatGPT can revolutionize supply chain management. By offering customized AI-driven solutions, the firm addresses industry-specific challenges, enabling businesses to streamline their operations and improve efficiency. Furthermore, these tailored applications contribute to enhanced customer service capabilities, underscoring the transformative potential of ChatGPT in optimizing supply chain processes [97].

B. inventory management

According to [54], ineffective inventory management can lead to missed sales opportunities, surplus inventory, and dissatisfied customers. Notably, 43% of small businesses in the United States identify inventory management as one of their primary challenges [98]. Additionally, U.S. retailers experience an annual loss of $1.75 trillion in 2022 due to issues related to stockouts and overstocking [99]. Author [60] demonstrates that ChatGPT can be integrated with inventory management systems to automate tasks such as real-time inventory updates, stock level forecasting, and reorder alerts. By analyzing historical sales data, demand trends, and supply chain dynamics, the ChatGPT model provides predictive insights into inventory requirements [54].

For instance, Logic, a leading global consultancy specializing in retail, integrated ChatGPT to manage seasonal inventory variations, anticipating high demand for specific products during holidays and preemptively placing orders to prevent stockouts, thus minimizing downtime in sales. This reduces overstocking and understocking, optimizing warehouse space and cutting costs associated with excess inventory and stockouts [100].

On the other hand, Carrefour, a leading French grocery retailer, has adopted ChatGPT to enhance its supply chain operations, with a particular focus on inventory management. Integrating ChatGPT with the company's Enterprise Resource Planning (ERP) and Warehouse Management System (WMS) through APIs enables ChatGPT to access and process data on stock levels, sales volumes, and reordering points. For instance, when stock levels of specific products fall below a predetermined threshold, ChatGPT can alert relevant departments or autonomously generate purchase orders. Additionally, the system provides real-time responses to customer inquiries, further demonstrating its potential to streamline operations and improve efficiency in supply chain management [101].

C. Transportation

In [102], some of the challenges faced in transportation logistics have been solved using ChatGPT, which provides solutions that fix these challenges, hence enhancing transportation operations. Another work [56] demonstrated that leveraging ChatGPT algorithms can significantly improve shipping routes with consideration of traffic conditions, fuel price, and delivery time constraints. Authors of [107] found that ChatGPT is capable of analyzing GPS data for forecasts for traffic that, based on these, enables companies to improve routes and lessen fuel consumption. Thus, it can analyze whether conditions predict possible delays or cancelations of flights themselves. The study by [103] highlights the potential of (GAI) tools such as ChatGPT in enhancing energy efficiency through route optimization and real-time driving recommendations. By analyzing parameters such as traffic conditions, road profiles, weather conditions, and other relevant factors, ChatGPT can identify and suggest optimal routes that minimize fuel consumption and travel time. This capability underscores the model's utility in promoting sustainable transportation practices and improving overall efficiency. ChatGPT also has the capability to predict bus bunching by analyzing the historical data, real-time data of the sensor, and other related factors, making the traffic more efficient [104]. These techniques could be altered to be incorporated with GPS data for traffic prediction so that transportation companies can notify clients immediately and adapt as required. Shipwell, a Texas-based transportation management platform, has integrated the advanced AI language model ChatGPT into its system. This integration allows shippers and carriers to interact with the platform using natural language, facilitating more intuitive and efficient responses to their inquiries [105].

It's worth noting that, ChatGPT can be fine-tuned for specific tasks like anomaly detection, forecasting, and predictive maintenance. This enables the transportation industry to identify potential problems early and take preventive measures, ultimately improving safety and efficiency [56].

D. Traffic safety

According to [106], the use of ChatGPT can greatly enrich the user experience with intelligent vehicles since it simplifies user interfaces in terms of natural languages for navigation, consultation, and real-time support. For example, Mercedes-Benz has improved its in-car voice

control system by using ChatGPT; thus, drivers do not have to remove their attention from the road to switch the devise temperature, request directions to eateries close by, ask for climate updates, find eateries close by, or switch other in-car settings [107]. On the other hand, incorporating ChatGPT with an automobile telematics system, like that of Mercedes-Benz, enables the proper collation of relevant driver data like speed, a history of routes taken, and the condition of the automobile [108]. When certain safety standards are set, such as the speed at which the vehicle should move, how long a driver should drive, and so on, ChatGPT can check on these parameters, which helps avoid an accident and or adherence to safety laws.

Moreover, the work of [109] explored the potential of ChatGPT for enhancing traffic safety analysis and decision-making, including automating accident report generation, augmenting traffic data, and conducting multisensory safety analysis to revolutionize the transportation industry. The authors argue that these models can significantly enhance various aspects of transportation, including traffic management, customer service, and autonomous driving. They highlight that ChatGPT's ability to process and analyze large datasets can lead to more efficient traffic flow and reduced congestion.

Another example is an accident report, an important tool for traffic safety analysis, and evaluation since it provides important incidence data with stakeholders from various disciplines [110]. In this context, the author provided a detailed accident report as a prompt to ChatGPT, requesting it to generate an analytical summary highlighting key facts. The model successfully identified and synthesized critical information, demonstrating its capacity for data analysis and reporting (Figures 11 and 12). Additionally, Table 10 consolidates key insights, case study examples, and operational improvements facilitated by ChatGPT in supply chain management, inventory optimization, transportation efficiency, and traffic safety. This comprehensive approach underscores ChatGPT's versatility and its potential to enhance operational workflows across various domains.

A collision between two automobiles occurred on a stormy afternoon at the intersection of East Alaskan Road. The automobiles involved were a 2019 Nissan (V1) and a 2018 BMW (V2). The incident caused minimal damage, notably to the right front bumper of V1 and the back left bumper of V2. The driver of the first car (referred to as D1) received a ticket for careless driving after being determined to be at fault in the accident. D1's careless driving was identified as the primary cause of the crash. The incident was limited to the bumpers of both automobiles, with no significant damage to other major components. Following a comprehensive evaluation, the evaluated repair cost was roughly $1,100 for V1 and $1,800 for V2. The impact was limited to both vehicles' bumpers, with no significant effects on any major components. The stormy weather conditions may have contributed to the collision by limiting the drivers' ability to brake or maneuver their vehicles effectively on low vision.

From the above accident information, extract the accident report with an analysis of important facts.
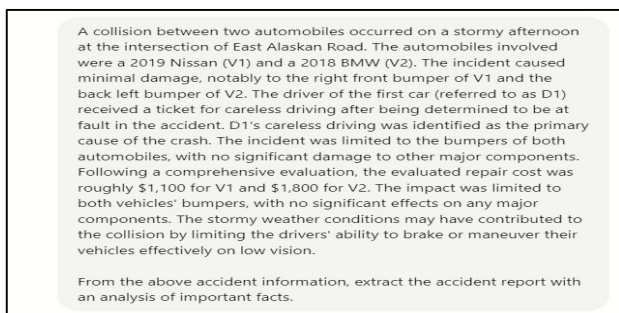
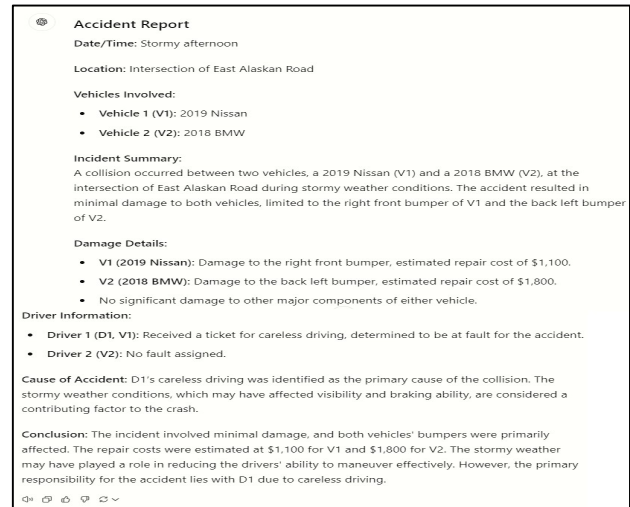Figure 11: A description of the accident scenario and the prompt question.

Figure 12: Screenshot of accident report generated by ChatGPT.

Table 10: Summary of the operational improvements related to ChatGPT's applications in supply chain, inventory management, transportation, and traffic safety:

Area	Key Insights	Case Study Examples	Operational Improvements
Supply Chain	- Enhances route optimization, predictive maintenance, and waste reduction.	- Sphere Partners: collaborates with supply chain organizations to implement ChatGPT solutions that optimize operations.	- Improves process performance and reduces costs across the supply chain. - Increases efficiency and supports organizational learning dynamics
Inventory Management	- Automates real-time inventory updates, stock predictions, and reorder notifications. - Provides predictive insights by processing	- Logic: Uses ChatGPT to manage seasonal inventory fluctuations, predict demand, and automatically order stock. - Carrefour: Integrated ChatGPT with ERP	-Minimizes overstocking/understocking issues, optimises warehouse space, and reduces costs. -Streamlines operations, enabling faster responses to inventory needs and improving overall efficiency.

	historical sales data and demand patterns	and WMS for real-time inventory management and automatic purchase order generation.	
Transportation	- Addresses challenges like route optimization, vehicle scheduling, and reduced fuel consumption.	-Shipwell: transportation management platform to integrate ChatGPT for natural language interactions with the system.	Improves safety and efficiency by identifying potential problems early and taking preventive measures, leading to cost savings, reduced fuel consumption, and improved customer satisfaction
Traffic Safety	- Enhances traffic safety protocols and driver interaction with vehicles - Automates accident report generation and analyzes traffic data.	- Mercedes-Benz: Integrated ChatGPT into in-car voice control for improved safety and convenience during driving.	- Reduces cognitive load and distractions, allowing drivers to focus on essential driving responsibilities. - Streamlines incident reporting and improves traffic management, leading to more efficient traffic flow.

RQ 1.6: How can ChatGPT be utilised to transform digital marketing, particularly in content creation, digital advertising, marketing strategy, and Email Marketing?

The integration of GAI, particularly ChatGPT, in marketing and social media has attracted attention for its ability to enhance marketing effectiveness. Beyond these areas, ChatGPT offers valuable applications in market research, virtual assistance, market entry strategies, segmentation, marketing planning, product development, and customer insights [62, 63]. This section outlines ChatGPT's primary contributions across core digital marketing disciplines, which include content creation, digital advertising, marketing strategy, and email marketing.

A. Content creation

The author of [64] conducted a comprehensive case study on the impact of ChatGPT on Instagram marketing. Their study explains how useful AI-generated content is in enhancing engagement rates and reducing the amount of time required to develop content to enhance the effectiveness of marketing. They saw that posts that were generated with the help of ChatGPT not only generated more likes and comments but also prompted referential interactions with the readers, thus improving the brand's customer loyalty and retention rates. From the examples provided, ChatGPT reveals great potential in generating content for different types of marketing communications [62].

It creates attention-catching, SEO-friendly blog posts and articles regarding topics related to its industry with the possibility of producing approaching content ideas that would interest consumers [63]. Coca-Cola has leveraged OpenAI's ChatGPT to develop unique and adaptable content for digital advertising, tailoring creative text to suit different markets and languages to maximize engagement across various social media platforms. By employing ChatGPT, the company generated location-specific ad copy that addressed diverse consumer interests. The AI model further created targeted, brand-specific content for social media platforms like Twitter, Instagram, and LinkedIn, including posts, captions, stories, and hashtags.

Similarly, Sephora, a leading beauty retail company, utilised ChatGPT to craft engaging and conversational content for Instagram. This included captions for product launches, beauty tips, tutorials, and stories, effectively enhancing their social media presence and consumer interaction. These examples illustrate the transformative role of ChatGPT in personalised digital marketing strategies [111]. Moreover, in content repurposing, ChatGPT helps switch between blog posts or articles and infographics, newsletters, or podcasts [112]. Besides expanding the reach of marketing content, this adaptability also answers to different audience preferences, which further optimises the use of primary content and advances overall content management.

B. Digital advertising campaigns

The work of [63] assessed the effects of ChatGPT in creating digital advertising campaigns through a critical literature review, secondary data analysis, and individual in-depth interviews (IDI). The study noted that ChatGPT's ability to create a variety of content, including promotional messages, email marketing, and social media recommendations, can help create concise and relevant segments of advertising campaigns and improve the process of content generation and advertising content distribution.

The author of [64]   marked that ChatGPT becomes a valuable tool in advertising, creating unique and effective ad copy for Google ads, Facebook, and Instagram that allows the particular marketers to find out what message is the most effective for some of the segments or areas.

NesGPT, which is a customized ChatGPT by the multinational food and beverage company Nestlé, has utilised ChatGPT to enhance its digital marketing [113]. This application particularly focuses on extending the captioning feature and hashtag optimization. Through monitoring of audience interactions, Nestlé has succeeded in applying ChatGPT to post contents that reflect people's interests, hence leading to better engagement. Therefore, this approach has boosted interaction rates and visibility, proving that ChatGPT can enhance the chances of engagement and thereby build brand awareness irrespective of the demographic bracket within the various countries of the internet marketing division. Furthermore, ChatGPT's predictive capabilities enable it to anticipate customer behavior, assess responses to marketing campaigns, and personalize advertisements based on the preferences of target groups [63]. Further, it is knowledgeable in generating creative slogans and taglines for marketing adverts, and campaigns are created to also reflect the brand's tone [65].

C. Marketing strategy

The sentiment analysis and customer information of ChatGPT help the marketer develop actual, more strategic business models and methods [66]. According to [65], ChatGPT has become a valuable resource in creating and implementing complex marketing operations across market research and target audience evaluation for strategy formulation. Through ChatGPT, marketers can analyze and gather significant amounts of market data quickly, including customer behavior understanding, competitor analysis, and industry changes to enable better decision-making. Marketers utilise ChatGPT to analyze industry-specific values, audience information, and business objectives, enabling the development of tailored strategic plans. The tool assists in establishing SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) goals that align with organizational strategies. Additionally, ChatGPT facilitates the demographic and psychographic categorization of target population groups, allowing for a more precise understanding of consumer needs and preferences [114]. According to [65] ChatGPT is capable of analyzing current market data, identifying target audiences, and recommending appropriate promotional channels. For instance, it could develop an effective strategy to market a project management tool specifically designed for remote workers. A notable example of this capability is demonstrated by Unilever. This British-Dutch multinational consumer goods company employed a GAI model resembling ChatGPT to craft a comprehensive marketing plan for its green product portfolio. This approach enabled Unilever to design a multifaceted strategy that aligns with sustainability goals while effectively engaging its target audience, showcasing the model's potential in advancing marketing innovation and precision [115]. In terms of customers, the beliefs and attitudes of the citizens towards the brand helped ChatGPT help Unilever develop specific strategies that would appeal to the increased environmentally conscious segment.

D. Email Marketing

ChatGPT is an invaluable tool for enhancing marketing efforts through personalized email campaigns and automated report generation [66]. In email marketing, GAI-powered tools like ChatGPT can generate customized email content tailored to specific customer segments, ensuring that the messaging aligns with customer preferences, past behaviors, or demographics. For instance, ChatGPT can create email subject lines and body content that resonate with various audience types, maximizing open rates and click-through rates [116]. ChatGPT can also be employed to automate routine tasks such as responding to customer inquiries or sending follow-up emails based on interactions, freeing up marketing teams to focus on strategy and creative development. For example, an e-commerce business might leverage ChatGPT to craft personalized email campaigns by inputting customer data and specific campaign goals, such as generating an email offering a 20% discount on shoes to customers who have abandoned their shopping carts [117]. This enables the creation of tailored messages for various customer segments, enhancing engagement and conversion rates.

A relevant case study is that of The New York Times, which implemented GAI tools, including GPT models for email personalization. By utilising AI to generate custom email copy based on user preferences and engagement patterns, they achieved a remarkable 70% increase in open rates [118]. Furthermore, HubSpot, a leading software platform for inbound marketing, uses GAI tools, including GPT models, to automate email marketing campaigns. Their system generates personalised email copy for different customer segments, improving engagement rates and reducing manual workload for marketers [119]. Similarly, CampaignsGPT, an advanced AI-powered tool inspired by OpenAI's ChatGPT, generates personalised email content by evaluating each customer's purchase history, interests, and segmentation to deliver customized recommendations and offers. In industries like the restaurant sector, such precise segmentation enhances campaign effectiveness significantly [120]. Additionally, the model optimizes timing by analyzing engagement patterns to identify optimal send times for individual customers, thus scheduling emails to maximize their impact. Figure 12 illustrates ChatGPT's usage in digital advertising, marketing strategy, email writing, and report generation. At the same time, Table 11 summarizes real case examples, practical applications, and corresponding example prompts

for ChatGPT's use in digital advertising, marketing strategy, email writing, and report generation, showing how companies leverage ChatGPT for practical tasks, improving efficiency, personalization, and overall marketing performance.
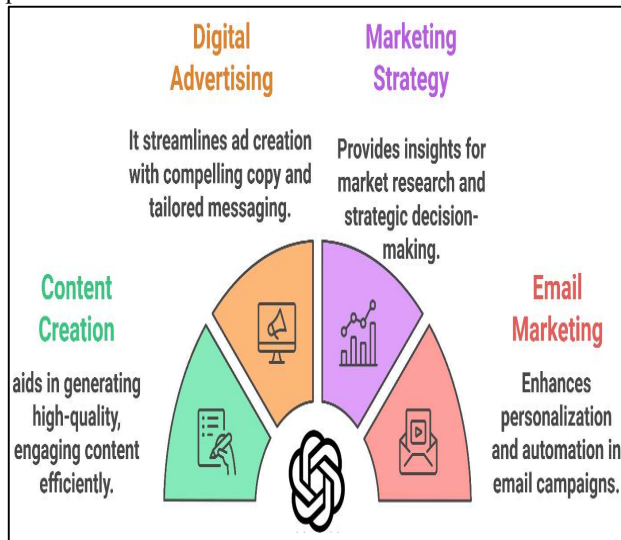

Figure 12: ChatGPT in the transformation of digital marketing.

Table 11: Summary of ChatGPT Applications in Digital Marketing: Case Studies, Use Cases, and Prompts

Category	Real Case Example	Practical Application	Example Prompt
Content Creation	Coca-Cola's collaboration with OpenAI Sephora's Instagram campaigns	- Generate attention-grabbing, SEO-friendly blogs and articles - Create captions, stories, and hashtags for platforms like Instagram, Twitter, LinkedIn - Repurpose content for infographics, newsletters, and podcasts	"Generate a creative Instagram caption for a product launch targeting young professionals who value sustainability."
Digital Advertising	Coca-Cola's collaboration with OpenAI Nestlé's NesGPT	- Ad Copywriting: Generate headlines, taglines, and CTAs for platforms like Google Ads, Facebook, etc. - Audience Targeting: Personalize ad content based on customer data - A/B Testing: Create multiple ad copy versions	"Generate a short, engaging Facebook ad promoting our eco-friendly water bottles, targeting millennials interested in sustainability."
Marketing Strategy	Unilever's green product campaign	- Market Analysis: Analyze consumer behavior and sentiment data - Strategy Drafting: Create outlines for brand awareness or product launches - Content Calendar Creation: Develop a detailed content calendar for campaigns	"Create a marketing strategy outline for launching a new vegan skincare line, focusing on social media and influencer partnerships."
Email Marketing	HubSpot's Automated Email Marketing The New York Times	- Personalised Emails: Craft personalised emails based on customer data - Automated Drip Campaigns: Generate sequences like welcome emails, follow-ups - Cold Emails: Write professional outreach emails for sales	"Write a follow-up email for customers who added items to their cart but didn't complete the purchase, offering them a 10% discount."
Report Generation	Microsoft's AI Reports	- Sales Reports: Summarize key metrics like revenue growth and retention rates - Campaign Performance Reports: Generate reports on metrics like CTR and ROI - Custom Reports: Create tailored reports based on data trends	"Generate a report on the performance of our latest email marketing campaign, focusing on open rates, click-through rates, and revenue generated."

RQ 2: What are the challenges and opportunities of integrating ChatGPT in these industries

The integration of ChatGPT across these industries provides numerous opportunities for enhanced efficiency, personalised service, and optimized operations. However, these benefits are accompanied by significant challenges, including security concerns, limited contextual understanding, and resistance to automation. To fully harness the potential of ChatGPT, careful implementation and ongoing human oversight are necessary to address these challenges effectively. The subsection below presents the significant opportunities and challenges in integrating ChatGPT across various industries.

In the context of the Tourism and Travel industries, ChatGPT provides the possibility of customized travel planning where tourists get recommendations according to their interests, budget, and former trips [6]. Furthermore, other AI technologies, such as messaging systems, can enhance customer service support, specifically booking and inquiries through round-the-clock services. ChatGPT's capacity to overcome language barriers shall be considered valuable because it may help tourists communicate with the

local providers of services [71]. In addition, ChatGPT can also be useful in setting dynamic prices and its marketing approach by identifying market trends and consumer preferences [38]. However, challenges tagged along with its integration include a lack of contextual awareness, which may hinder the system from affecting current conditions, for instance, weather or local disruption [121]. Furthermore, privacy issues arise from the data processing of such sensitive information and the ever-persistent preference of people to interact with a live person. At the same time, travel presents some great challenges to the expanded use of smart technologies in this value chain [40, 122].

In banking and finance, this resembles improved services to customers by helping them with any banking concerns, applying for loans, and offering recommendations on investments [42]. It can also be incorporated into fraud identification systems that enable organizations to be put on the lookout for the likelihood of fraud risks happening in the future. However, it can also be applied in financial education by providing custom recommendations and enhancing customer's awareness of the financial offerings [44]. The model can also be helpful when it comes to creating reports on compliance as well as knowing which regulation to adhere to. One of the big issues in this sector is security risks: using GAI in finances entails the risk of endangering customer's data to cyber threats [43]. Still, trust issues cannot be ignored and are a limiting factor, especially as most clients like to speak to a human being, especially when it comes to financial issues [45]. The challenge of implementing AI only gets worse when it has to meet stringent financial standards to approve the content [43].

In the construction industry, ChatGPT is a potential strategy that can be applied to automate construction projects, predict likely delay timeframes, and find ways of utilising resources to enhance construction projects [46]. It can aid in deciding on materials to purchase because it can analyze supplier information to cut costs and determine substitutes. Further, the model can reduce documentation procedures by creating contracts, permits, and compliance documents. Further, scenario planning that incorporates a precise definition emphasizes that a company's situation may change during project implementation by indicating potential adverse changes and the actions that ChatGPT needs to take to retain control of the project [47]. Nevertheless, some challenges are still present, such as the precision and context-sensitive potential of AI-derived recommendations [48]. Heavy construction needs strict real-time information, while ChatGPT may not possess the level of construction specialization required for highly technical functions such as structural design or safety mapping [49]. Moreover, a lack of acceptance of the automation process may also be an issue, given the efforts of various professionals in various industries.

In the software solutions industry, ChatGPT is present in a way that can help designers generate code more quickly, identify bugs, and improve algorithms as needed. They can be incorporated into customer service to help solve problems such as repair hassles or answer questions regarding a certain product [50]. Also, ChatGPT can help develop product manuals, technical descriptions, and user manuals – all the things that will take time for the development team [90]. One advantage is that ChatGPT is capable of learning continuously and can refer to coding tutorials and best practices in a short space of time [51]. However, there are issues about the quality of the code generated, as the AI can generate unwarranted or insecure code and may be required to be reviewed [50]. There may also be about 40% adaptations needed to incorporate ChatGPT into current software development workflows [52, 90]. Furthermore, for the complex environment of propagation structures, ChatGPT may not be perceiving all aspects of dependency and might exhibit error-inducing outcomes [50]. However, its responses are often accompanied by generic information, which may still need further optimization to be used in the software solutions industry.

In the supply chain and transportation industry, ChatGPT aids in supply chain forecasting, helping companies respond more quickly to market changes [60]. Its ability to recommend efficient transportation routes based on real-time data improves operational efficiency and reduces costs [59]. Furthermore, it can enhance customer communication by providing real-time updates on shipping and delivery status. Nevertheless, the integration of ChatGPT into this industry faces challenges, particularly in terms of data integration across complex, interconnected systems [54]. Managing intricate aspects of the supply chain, such as international shipping regulations and inventory variability, may extend beyond ChatGPT's capabilities without advanced integration. Moreover, unpredictable external factors like natural disasters or geopolitical events may limit the effectiveness of GAI-driven solutions [55, 58]. Additionally, supply chains depend on real-time data for effective decision-making, and ChatGPT's current lack of live integration may constrain its operational applicability. Integrating ChatGPT into inventory management offers improved digital communication with suppliers and partners, enhancing collaboration and transparency and fostering a more flexible, responsive inventory system [123]. Moreover, inventory systems process extensive data across multiple platforms, necessitating robust cybersecurity measures to protect against potential threats [57]. On the other hand, in traffic safety, ChatGPT has the potential to support self-driving technology, which may significantly reduce human error [103, 124]. However, increased reliance on connected vehicle systems and traffic management technologies introduces vulnerabilities to cyberattacks, posing potential risks to public safety [125].

Finally, in the digital marketing industry, ChatGPT provides opportunities for content creation, analyzes customer data to segment audiences, creates personalised marketing campaigns, and enables marketers to maintain a consistent content output across platforms. ChatGPT can assist in optimizing ad campaigns by analyzing performance data and providing real-time suggestions for targeting and messaging [65]. On social media, ChatGPT can interact with customers, answer questions, and address complaints in real time [63]. However, the creative limitations of AI pose challenges, as ChatGPT may struggle with producing original and emotionally nuanced content [64]. Maintaining a consistent brand voice across all digital channels can also be difficult with AI-generated content [62]. Finally, over-reliance on automation in customer interactions may diminish the human connection essential for building brand loyalty. Table 12 highlights both the potential benefits and key challenges to consider for effective ChatGPT integration within each industry.

Table 12: Summary of the opportunities and challenges of ChatGPT adoption for each industry:

Industry	Challenges	Opportunities
Tourism and Travel	- Language nuances may lead to misunderstandings. - Limited personalization without deep user data. - Lacks real-time data on travel conditions.	- 24/7 customer support for queries. - Multilingual support reduces need for human translators. - Suggests itineraries and travel tips.
Banking and finance	- Data security and compliance are crucial. - Limited depth for complex financial queries. - Risk of misinformation impacting trust.	- Automates routine customer queries. - Fraud detection through conversation analysis. - Promotes financial literacy through simple explanations.
Constructions	- On-site real-time decision-making is challenging. - Industry-specific terminology is complex. - Incomplete safety compliance knowledge.	- Assists in project management and scheduling. - Offers preliminary cost estimation and resource planning. - Generate progress reports and status updates. - Analyzing project plans and
Software Solutions	- Code quality and debugging accuracy vary. - Rapid tech changes can lead to outdated responses. - Data privacy concerns in troubleshooting.	identifying challenges. - Supports coding, debugging, and documentation. - Automating documentation and monitoring code changes. - Provides customer support for software functionalities.
Supply Chains and Transportation	- Lack of real-time data integration. - Complexity of logistics and international regulations. - Data privacy risks with sensitive logistics data. - Ensuring a consistent brand voice across digital channels can be challenging with GAI-generated content	- Customer support for order tracking and updates. - Addressing common queries efficiently (e.g., tracking shipments). - Supports predictive analysis for demand patterns. - Automating accident report generation and traffic data analysis
Digital Marketing	- Content quality and brand tone control are challenging. - Quickly changing trends require frequent updates. - Data privacy in handling social data.	- Streamlining content creation and social media posts. - Identifying implicit hate speech and improving online safety. - Engages customers by responding to queries. - Enables personalised marketing recommendations. - Formulating data-driven marketing strategies.

5. Discussion across six key industry sectors

The findings of this study underscore the transformative potential of ChatGPT across multiple industries while also

highlighting key challenges that need to be addressed to maximize its integration within Industry 4.0 and Industry 5.0. These results offer unique insights, particularly in relation to the specific sectors examined. Results from this study underpin the high transformational potential of ChatGPT and generative AI to increase operational efficiency, customer satisfaction, and innovation in various industries while comparing with the extant literature [6, 7, 36, 71]. This makes ChatGPT very special in automating customer service, planning a trip, or offering personalised recommendations.

in tourism and travel: This is illustrated by case studies such as Expedia Group and DERTOUR, which have significantly improved customer satisfaction and operational efficiency. These findings agree with the available literature, which shows the rise of GAI into the mainstream, real-time customer interactions, and multilingual support, but extend this understanding by underlining the role of ChatGPT in optimizing booking systems and dynamic travel planning.

in the banking and finance: ChatGPT and its application in the automation of routine inquiries, fraud detection, and personalised financial advice in the banking sector further validate earlier research that has underlined the efficiency of GAI-powered tools in financial services [41, 42]. While earlier studies have focused on fraud detection and process automation [43, 44], the present study augments these findings by focusing on the role of ChatGPT in developing full SAR reports and improving customer interaction with virtual assistants like Erica at Bank of America. This suggests a broader operational impact than has traditionally been considered.

In the construction industry: ChatGPT's role in generating schedules, predictive analysis, and resource optimization confirms earlier findings that GAI increases the efficiency of project management [46-48]. However, unlike previous studies that have largely highlighted risk management and predictive analytics [49], this research pinpoints tools like Civils.ai, which allow for real-time adjustments in projects and enhance the documentation workflow to surmount inefficiencies characteristic of traditional construction processes which highlights ChatGPT's enhanced utility in fostering sustainability and precision.

In software solution and development: Similarly ChatGPT's contributions to coding assistance, debugging, and collaborative development processes are in line with earlier research that recognized GAI as making software engineering processes more efficient [50, 52, 90]. Prior work has mentioned the role of ChatGPT in enhancing debugging and code generation [126]. Still, the current study extends these insights by demonstrating the role of ChatGPT in requirements gathering, ERP system life cycles, and collaborative solutions such as GPTCOMCARE, which offers alternative methods of problem solving.

In SCM and transportation: the current study reveals the role that ChatGPT can play in inventory management, route optimization, and enhanced safety measures. Though previous studies have primarily focused on the role of GAI in predictive maintenance and logistics [54-56], this research provides new insights into how ChatGPT can integrate with ERP systems to update inventory status in real-time and enable automatic reordering processes, as shown in companies like Carrefour and Logic. Furthermore, this research underscores the applicability of ChatGPT in forecasting traffic patterns and optimizing routes, building upon prior discoveries by stressing its contribution to enhancing sustainability via improved fuel efficiency and alleviated congestion. This study further emphasizes the integrations of ChatGPT with an automobile telematics system, like that of Mercedes-Benz. Also, this study underlines ChatGPT's capabilities in assisting with accident report generation.

Finaly, **in the realm of digital marketing and social media:** The Utilisation of ChatGPT in the realms of customized content generation, targeted advertising, and marketing approaches builds upon previous studies that acknowledged the potential of AI to improve engagement [62, 63]. This research illustrates ChatGPT's efficacy in assisting organizations such as Coca-Cola and Sephora in developing culturally relevant campaigns and producing content that is conducive to SEO, thereby enhancing prior conclusions by highlighting its incorporation into multi-channel marketing tactics. Such instances emphasize ChatGPT's capability to foster both efficiency and personalization.

Notwithstanding these developments, the research also highlights critical concerns, such as data privacy issues, ethical issues, and the loss of jobs for human workers. These concerns are repeatedly echoed in other studies. The current study, however, presents a comparative evaluation by underlining specific flaws in ChatGPT, namely its narrow contextual awareness when dealing with rapidly updating domains such as travel or traffic, which has been discussed nowhere else in recent literature. It also brings forth the need for regulatory mechanisms and compatibility of systems, which aligns with the human-centered goals of Industry 5.0.

6. Prospective Research Avenues and Conclusion

Incorporating ChatGPT and generative AI (GAI) across many industries has revealed considerable promise for improving operational efficiency, personalization, and sustainability. The swift advancement of these technologies highlights the necessity for future studies to fill current gaps and investigate unexplored prospects. A vital domain for future investigation is the establishment of comprehensive frameworks for overseeing data privacy and ethical implications related to the deployment of ChatGPT. Research conducted by Nishant and Rane [3, 127] highlights that although ChatGPT's data-driven

functionalities are revolutionary, persistent concerns regarding security and transparency may impede its extensive use. Research must, therefore, focus on building adaptable regulatory frameworks that reconcile innovation with ethical accountability. A promising direction for future research involves optimizing ChatGPT for industry-specific applications, especially in complex sectors such as healthcare and education, which pose considerable challenges due to their stringent precision requirements and human-centric interactions [17]. Creating tailored iterations of ChatGPT that include domain-specific knowledge and contextual understanding may enhance its effectiveness in various fields. The shift from Industry 4.0's emphasis on automation to Industry 5.0's focus on human-AI collaboration necessitates research into ChatGPT's contribution to promoting sustainable practices and augmenting creativity across many sectors [27]. Research should elucidate how ChatGPT might reconcile technical efficiency with human-centric objectives, including customer satisfaction and employee well-being.

Furthermore, subsequent research should examine the enduring economic and societal effects of ChatGPT on workforce dynamics. The instrument improves efficiency and decreases operating expenses, although it also prompts apprehensions regarding job displacement and skill obsolescence [54]. Understanding how industries might adopt ChatGPT without affecting workforce stability is vital. Investigating techniques for reskilling and upskilling personnel to adjust to GAI-augmented workflows will be essential for alleviating these issues.

In conclusion, this study provides a comprehensive review of ChatGPT and other generative AI instruments, qualitatively examining how they function, opportunities, and positional dilemmas across industries within the frameworks of Industry 4.0 and Industry 5.0. The current research provides evidence in support of the proposition that ChatGPT indeed provides substantial operational efficiencies, including instant customer service, analytics, resource management, and customized marketing. The study also exposes the issues that organisations must confront when implementing GAI systems like ChatGPT. Some of them involve data privacy issues, job automation, which may remove human employees from executing their tasks, and integration with operational systems as industries transition towards using amalgamated man and Artificial intelligence in Industry 5.0. Thus, this study not only confirms through a literature review that ChatGPT can be revolutionary but will provide practical advice for industries to adopt AI tools if they have similar goals. This research provides the foresight and use case directory for applying ChatGPT and such technologies to the challenge of Industry 5.0 requirements.

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Conflicts of Interest

Reference

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