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Husam Alfahl
Taibah University
Kingdom of Saudi Arabia

Electronic Commerce Systems Development: Exploring the Best Practice for Artificial Intelligence Applications

Abstract

Purpose: This study explores best practices for developing artificial intelligence applications in electronic commerce businesses and examines factors that may influence the adoption of such applications in this sector.

Study design/methodology/approach: A quantitative research approach was employed, using a survey questionnaire for data collection and structural equation modeling for data analysis.

Sample and data: A total of 264 valid responses were obtained from participants who are currently employed, utilize technology in their professional activities, hold current or previous managerial roles, work in businesses that sell products or provide services online, and incorporate artificial intelligence into their work practices.

Results: The findings indicate that businesses prefer in-house development of artificial intelligence applications to maintain competitive advantage by leveraging real business data for artificial intelligence training. Moreover, the characteristics of artificial intelligence technology and organizational capabilities significantly and positively affect the adoption of new artificial intelligence applications in electronic commerce businesses.

Originality/value: The study addresses critical gaps by identifying best practices for developing artificial intelligence applications in electronic commerce businesses, emphasizing the importance of data management, privacy, and governance, as well as offering a framework for the adoption of artificial intelligence applications.

Research limitations/implications: The study is limited by a small sample size and focuses solely on electronic commerce businesses. The results of this research can guide electronic commerce businesses in making informed decisions about adopting new artificial intelligence solutions aligned with their operational goals.

Keywords: Business Information Systems, Electronic Commerce, Artificial Intelligence, Information Systems, Business Analytics, Technology Adoption.
JEL classification: L81, M1

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الملخص

تطوير أنظمة التجارة الإلكترونية: استكشاف أفضل الممارسات لتطبيقات الذكاء الاصطناعي

حسام الفحل

جامعة طيبة

المملكة العربية السعودية

هدف الدراسة: تستكشف الدراسة أفضل الممارسات لتطوير تطبيقات الذكاء الاصطناعيّ في شركات التجارة الإلكترونيّة، وتدرس العوامل التي قد تؤثّر على تبنّي تطبيقات الذكاء الاصطناعيّ في هذه الشركات.

تصميم/ منهجية/ طريقة الدراسة: اعتمد الباحث على منهج البحث الكمّيّ في الدراسة، وذلك باستعمال الاستبيان لجمع بيانات الدراسة ونمذجة المعادلات الهيكليّة لتحليلها.

عينة الدراسة وبياناتها: جُمعت 264 استجابة من مشاركين يعملون حالياً، ويطبّقون التكنولوجيا في أعمالهم، ولديهم خبرة إداريّة حالية أو سابقة، ويعملون في شركات تبيع منتجات أو تقدّم خدمات عبر الإنترنت، ويستعملون الذكاء الاصطناعيّ في عملهم.

نتائج الدراسة: بيّنت نتائج الدراسة أن شركات التجارة الإلكترونيّة تُفضّل تطوير تطبيقات الذكاء الاصطناعي داخلياً؛ للحفاظ على ميزتها التنافسيّة والاستفادة من البيانات التجاريّة الحقيقيّة في تدريب أنظمة الذكاء الاصطناعيّ، وأكّدت النتائج أيضًا أن خصائص تكنولوجيا الذكاء الاصطناعيّ والقدرات التنظيميّة تُؤثّر تأثيرًا كبيرًا وإيجابيًا على تبنّي تطبيقات الذكاء الاصطناعيّ الجديدة في شركات التجارة الإلكترونيّة.

أصالة الدراسة: تعالج الدراسة فجوات بحثيّة، وذلك بتحديد أفضل الممارسات لتطوير تطبيقات الذكاء الاصطناعيّ في شركات التجارة الإلكترونيّة، مع التركيز على إدارة البيانات والخصوصيّة والحُوكمة، بالإضافة إلى تقديم نموذج مفاهيميّ لتبنّي تطبيقات الذكاء الاصطناعيّ في هذه الشركات.

حدود الدراسة وتطبيقاتها: يُعدُّ حجم عيّنة الدراسة صغير نسبياً، وهي تركّز حصريًا على شركات التجارة الإلكترونيّة، ويمكن لشركات التجارة الإلكترونيّة الاستفادة من نتائج هذا البحث؛ لاتّخاذ قرارات مدروسة بشأن تبنّي حلول ذكاء اصطناعيّ جديدة تتماشى مع أهدافها لغرض تحسين عملياتها.

الكلمات المفتاحية: نظم معلومات الأعمال، التجارة الإلكترونية، الذكاء الاصطناعي، نظم المعلومات، تحليلات الأعمال، تبني التكنولوجيا.

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Introduction

The use of electronic commerce (e-commerce) by consumers to purchase products or services online is growing rapidly. According to Bawack et al. (2022) e-commerce is becoming a global norm, especially after the COVID-19 pandemic. In 2023, for example, consumers spent nearly $1.3 trillion on online retail in the United States of America (USA)-the highest amount ever recorded for e-commerce businesses in the country (comScore, 2024). Similar trends are observed elsewhere, in the same year, 63.7% of internet users in the Kingdom of Saudi Arabia (KSA) made online purchases. Given this growing demand, businesses must upgrade and optimize the information systems (IS) that support their online shops or applications to improve the customer experience. Developing business information systems (BIS) with integrated artificial intelligence (AI) and business analytics capabilities should be a strategic priority for many businesses.

A recent study by PwC assesses the economic potential of AI, indicating that it is poised to be a transformative force, with the potential to boost the global economy by up to $15.7 trillion by 2030, despite still being in an early stage of development (PwC, 2020). Ensuring data quality, consistency, and security is essential for the successful implementation of AI; however, e-commerce enterprises often face challenges in organizing and integrating the complex, large-scale, and heterogeneous datasets required for AI-driven solutions (Jakkula, 2022). AI training data is vital for the development of AI models and directly influences the performance of AI systems, particularly in supervised and reinforcement learning, making it a significant regulatory concern (Hacker, 2021). The effectiveness of various AI systems, including their decisions and actions, depends heavily on the datasets used for training these systems (EU Commission, 2020). Large volumes of data are essential, forming the foundational basis for machine learning algorithms to learn, make predictions, and progressively improve their performance. Indeed, AI applications require high-quality, appropriate, representative, and accurate data to achieve optimal outcomes (Aldoseri et al., 2023). In addition, data governance is necessary to ensure that the data used in training and managing AI systems is accurate, fair, and properly applied (Maslej et al., 2024).

Although most machine learning research assumes that input data is easily accessible, the process of data collection has recently become a key research focus within the data management community (Whang et al., 2023). Currently, there is a lack of empirical studies on AI applications in e-commerce (Kashyap et al.,

2022). Bawack et al. (2022) suggest that future research should explore the ethical and privacy challenges that may hinder AI adoption in e-commerce. To develop AI applications for e-commerce, businesses must supply data to train these AI systems so they can be effectively deployed. A primary concern is the source of training data. Ideally, organizations should rely on their own data to ensure the integrity of the development process, which can be conducted in-house to meet the organization's specific needs. However, investment in AI and other advanced systems can be extremely costly, and their development requires highly skilled experts. Therefore, organizations might opt to outsource the development of such systems to information technology development vendors who have the right expertise and experience. Nevertheless, concerns may arise about sharing real business data with these vendors, including issues related to data privacy, security, and accessibility.

The current study seeks to address research questions and gaps identified by Sunyaev et al. (2023) for future investigation. Specifically, the study investigates how businesses manage their data as a critical resource for training AI applications-whether they share their data with AI providers or develop systems internally to maintain a competitive advantage. The aim of this study is to explore best practices for utilizing real business data intended for training AI systems during the development of new AI systems. Thus, this research contributes to the literature by exploring best practice in the development of BIS with embedded AI and business analytics capabilities for e-commerce businesses. In addition, it identifies factors that may influence the adoption of new AI systems. The findings can support e-commerce businesses in developing AI solutions. The next section reviews the relevant literature and outlines the theoretical background. This is followed by the research questions and methodology, then the results of the data analysis. The article concludes with a discussion and summary.

Literature Review

Today, businesses must adapt to the rapidly changing business environment to remain competitive and sustain operations. Thus, technology adoption and IS development can support organizations in addressing these adaptive challenges. In addition, AI applications can enable workers to perform their tasks more efficiently with higher quality (Maslej et al., 2024). However, empirical research on AI and its innovation in e-commerce lacks systematic understanding and remains in its early stages (Cheng et al., 2023; Mikalef & Gupta, 2021). Furthermore,

Ahmad et al. (2023) highlight a shortage of research on the data management and modelling requirements for AI systems.

In this section, key concepts are clarified. According to Pankowska (2015) BIS is defined as: "*a computer-based system [that] helps employees deal with the planning for, development, management, and use of business information*". In this study, BIS, IS, and e-commerce applications are used interchangeably. Moreover, AI refers to "*a computer system that is built or programmed to think like human beings and rationally solve problems by applying disciplines such as understanding languages, possessing knowledge, and also it is automated and has a robotic function*" (Rath et al., 2022). AI has also been defined as "*a collective term for computer systems that can sense their environment, think, learn, and take action in response to what they're sensing and their objectives*" (PwC, 2020). Another definition states that "*AI is the ability of a system to identify, interpret, make inferences, and learn from data to achieve predetermined organizational and societal goals*" (Mikalef & Gupta, 2021). In this study, AI capabilities refer to any BIS with embedded AI and business analytics features. Furthermore, business analytics is defined as "*a set of computer technologies, statistical techniques, and mathematical models to discover meaningful patterns or relationships in data for the purpose of gaining insights into business operations and making better, fact-based decisions*" (Kuo & Li, 2014). Lastly, e-commerce can be defined as "*the buying and selling of goods and services on the Internet*" (Harshitha et al., 2024).

According to PwC (2020), AI applications include automated intelligence, assisted intelligence, augmented intelligence, and autonomous intelligence. AI can drive performance improvements in terms of scale, customization, innovation, flexibility, speed, and decision-making (Borges et al., 2021). For e-commerce businesses, AI can be implemented across various business functions to enhance efficiency and productivity. The integration of AI in e-commerce enables businesses to deliver personalized shopping experiences and customized recommendations to boost customer engagement and brand loyalty. Additionally, AI can optimize operational processes such as inventory management, supply chain logistics, and predictive market analytics, resulting in enhanced organizational performance and cost-effectiveness (Boukrouh & Azmani, 2024; Marjerison et al., 2022; Mikalef et al., 2019; Pallathadka et al., 2023; Tang et al., 2023; Tran & Huh, 2023).

Businesses' primary concerns with AI include privacy, data security, and reliability. Privacy and data governance risks have been identified as the foremost

global challenges associated with the adoption of responsible AI tools (Maslej et al., 2024). In addition, according to Mikalef and Gupta (2021), data is one of the key enablers in harnessing the potential of AI applications, and the availability of high-quality data is critical, as it must be used during the training of the AI application. The availability of adequate and reliable data is essential for the effective functioning of the AI application. Therefore, it is vital for society as a whole to ensure the provision of sufficient reliable data to allow machines to operate efficiently (Nti et al., 2023). One of the main barriers to implementing AI is the lack of adequate systems and data. All new AI systems must be trained using real data before they are deployed. This process is referred to as machine learning. Such learning enables AI systems to make predictions and identify patterns (Sharda et al., 2021). Machine learning involves discovering connections within data and cases by being exposed to a large volume of relevant data and examples (Sharda et al., 2021). According to Maslej et al. (2024), the cost associated with training AI models can be very high. For instance, OpenAI's ChatGPT-4 training cost is estimated at $78 million, while Google's Gemini Ultra training cost is projected at $191 million (Maslej et al., 2024).

A substantial number of studies are related to this topic. Some researchers have examined the adoption of AI applications within businesses across different contexts (Agarwal et al., 2024; Barata et al., 2024; Bisht et al., 2024; Chen et al., 2023; Kar & Kushwaha, 2023; Merhi & Harfouche, 2024; Pillai & Sivathanu, 2020; Rahman et al., 2023; Rawashdeh et al., 2023). Others have provided literature reviews on the application of AI in e-commerce (Bawack et al., 2022; Borges et al., 2021; Boukrouh & Azmani, 2024; Erdogan, 2023; Fedorko et al., 2022; Necula & Pavaloaia, 2023; Saleem & Naseem, 2023; Zhang et al., 2023). Additional studies explore the application, role, impact, and utilization of AI in e-commerce (Ayyapparajan & Sabeena, 2022; Cheng et al., 2023; Fatima, 2023; Gochhait et al., 2020; Gupta et al., 2024; Gururaj, 2021; Haidar, 2024; Harshitha et al., 2024; Hassan & Abdulkhaleq, 2022; Kashyap et al., 2022; Khrais, 2020; Lari et al., 2022; Marjerison et al., 2022; Micu et al., 2021; Mikalef et al., 2019; Prabha, 2021; Rashidin et al., 2021; Shyna & Vishal, 2017; Song et al., 2019; Soni, 2020).

In this section, some studies relevant to the current research topic are introduced. Hacker (2021) examines the legislative challenges related to AI training data in the European Union (EU), offering a detailed analysis of the existing legal framework and suggesting key changes to address three major risks: data quality,

discrimination, and innovation. The article emphasizes that training data poses substantial regulatory challenges due to its critical role in AI development and the associated risks (Hacker, 2021). Hacker (2021) also points out the need for a suitable legal structure for AI training data that effectively balances individual protection with the promotion of innovation.

Aldoseri et al. (2023) provide a comprehensive analysis of the challenges and opportunities associated with utilizing data for AI, recommending the implementation of robust data management techniques to fully utilize AI's capabilities while also maintaining ethical and security standards. The European Commission's White Paper on Artificial Intelligence, published in February 2020, presents a strategic framework for AI development in Europe and a legal framework to support a high-quality and reliable ecosystem. The European Commission supports a regulatory approach that considers the level of risk associated with AI applications, especially those that present significant risks (EU Commission, 2020). Another report published by the European Parliamentary Research Service in February 2023 aims to modernize the EU's liability framework to address the specific challenges posed by AI systems. While the concept has been mostly well-received, there are concerns regarding its adequacy, compliance with the AI Act, and potential impact on innovation (Madiega, 2023).

The EU's AI Act (2024) is a comprehensive legislative framework intended to ensure the reliability and conformity of AI systems with European principles. This Act categorizes AI systems based on their level of risk, ranging from being completely unacceptable and prohibited to minimally regulated. The AI Act outlines procedures to ensure compliance and imposes substantial penalties for non-compliance, with the aim of promoting innovation, protecting basic rights, and fostering public trust in AI technologies. Article 10 of the AI Act introduces a detailed governance framework for managing training, validation, and test data-collectively referred to as training data. Article 10 also specifies that governance for properly managing the training datasets must consider data collection methods, data processing, inherent biases, and data gaps. The datasets should demonstrate relevance, representativeness, accuracy, and the highest possible degree of completeness. In addition, high-risk AI systems are required to use datasets of high quality, relevance, and representativeness for training, validation, and testing purposes. Robust data governance policies are essential to ensure that the data is free from errors and biases that could compromise health, safety, or fundamental rights. Ar-

ticle 10 also permits the use of sensitive personal data to detect and correct bias, subject to strict safeguards. These requirements aim to ensure that high-risk AI systems are developed on a sound and impartial data foundation, promoting safety and reliability. The next section presents the research questions and framework.

Research Questions and Framework

In response to recent research gaps identified by Sunyaev et al. (2023) the following three research questions are proposed:

1. How do e-commerce businesses deal with current data usage for AI training during the development of BIS with AI capabilities?
2. Should e-commerce businesses share their data with AI vendors, or should they develop BIS with AI capabilities internally to preserve competitive advantage?
3. What are the best practices among e-commerce businesses for utilizing existing business data for AI training (machine learning) during the development of systems or software with AI capabilities?

Ronaghi (2023) developed a research framework for AI systems adoption, presented in Figure 1. Based on this framework, a fourth research question is formulated:

4. Do technology characteristics, organizational capabilities, and the external task environment influence AI adoption within e-commerce businesses?

This fourth research question leads to three hypotheses to be tested in this study:

H1: *Technology characteristics (TC) have a significant positive effect on AI adoption (AIA) within e-commerce businesses.*

H2: *Organizational capabilities (OC) have a significant positive effect on AIA within e-commerce businesses.*

H3: *The external task environment (ETE) has a significant positive effect on AIA within e-commerce businesses.*

Table 1 provides the definitions of these concepts. Table 2 presents the items used to measure the constructs presented in Figure 1, as proposed by Ronaghi (2023). The remainder of this article focuses on answering and discussing these research questions and hypotheses.

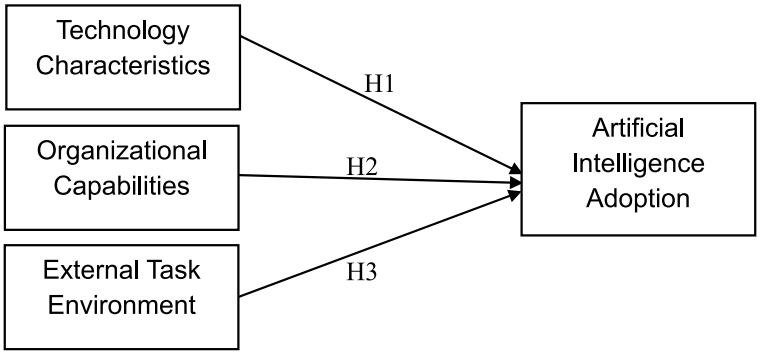

Figure 1: The Theoretical Framework Adopted from Ronaghi (2023)

Table 1
The Definition of the Constructs in the Research Framework Presented in Figure 1

Construct	Definition
Technology Characteristics (TC)	This variable includes perceived advantages, security, complexity, and the ability to integrate and apply a technology (Ronaghi, 2023).
Organizational Capabilities (OC)	This includes organizational readiness, senior managers' support, managerial capabilities, and allocation of the necessary resources (Ronaghi, 2023).
External Task Environment (ETE)	This includes competitive pressure, government policy and the regulatory environment, and support from software vendors (Ronaghi, 2023).
Artificial Intelligence Adoption (AIA)	"The organizations' decision-making process of choosing new technology for its requirements" (Pillai & Sivathanu, 2020).

Research Methodology

To answer the research questions, quantitative research methods, including structural equation modeling (SEM) were employed, as suggested by Field (2013) and Hair et al. (2010). To collect the primary research data, a survey questionnaire comprising three main sections was developed. The first part included demographic questions. The second consisted of items seeking participants' opinions on the first three research questions to understand their views on best practices of AI system development. The third part, adopted from Ronaghi (2023), focused on answering the fourth research question and evaluating the three proposed research hypotheses (see Table

2). For validation, the questionnaire was reviewed by three associate professors from different universities specializing in management information systems. Subsequently, the survey was distributed to participants and data was collected via the Prolific platform. Inclusion criteria were: participants must be currently employed, use technology at work, have current or prior managerial experience, work in businesses that sell products or provide services online, and use AI systems or software in their work. Prolific provided the necessary screening to select appropriate participants. In addition, the questionnaire included screening questions to verify participant eligibility. After reviewing the collected data, 264 valid responses were retained and analyzed using SPSS and AMOS, a powerful SEM software developed by IBM.

Table 2
The Survey Instrument for the Fourth Research Question (Ronaghi, 2023)

Construct	Item Used
Technology Characteristics (TC)	The use of AI has an advantage over other technologies.
	AI saves the company financial costs.
	It is easy to learn and work with AI software and equipment.
	AI speeds up the work processes.
	AI helps with customer service and enterprise resource management.
	AI increases our productivity.
	AI enhances the effectiveness of activities and decisions.
	AI technology has good security.
	Privacy and confidentiality aspects are preserved in AI technology.
	AI is a safe technology, and its error is low.
Organizational Capabilities (OC)	Sufficient budget is allocated for AI deployment.
	There are professionals with AI-related knowledge in our company.
	Senior executives have sufficient support for AI deployment.
	Senior executives are aware of the benefits of AI.
	Employees have the necessary knowledge of AI capabilities.
	There is partnership between managers and staff in the AI project.
	There is an incentive to deploy AI among employees.

Cont. Table 2
The Survey Instrument for the Fourth Research Question (Ronaghi, 2023)

Construct	Item Used
External Task Environment (ETE)	There is pressure from the environment and competitors to use AI.
	Our company monitors the performance of other companies in the field of AI.
	AI vendors provided the necessary training for employees.
	Appropriate support is provided by AI vendors during the deployment process.
	Appropriate support is provided by AI vendors after the deployment process.
	Government laws and regulations provide adequate protection for AI technology.
Artificial Intelligence Adoption (AIA)	The AI deployment schedule is specified.
	There has been sufficient funding and support from AI project managers.
	Customers welcome products in line with AI innovation.
	Employees are motivated and involved in using AI.
	The use of AI facilitates processes and improves product quality.

Research Results

The results of the analysis of the collected data are presented in this section. Table 3 provides the demographic information of the participants. In this research, various statistical analyses were conducted using SPSS and AMOS. The analysis began with descriptive statistics using SPSS for the second part of the questionnaire, which addressed the first three research questions and aimed to capture participants' views on best practices in AI systems development. This section included 11 survey items. Figure 2 shows that 92.8% of participants reported that their companies provide them with systems or software equipped with AI capabilities for work purposes, while 5.7% of participants indicated that their companies are currently in the process of developing such systems.

Table 3
Demographic Profile of Participants

Item	Group	Number	Percentage
Do you currently hold a managerial position in your company?	Yes	241	91.3%
	No	23	8.7%
What is the size of your company?	50 Employees and less	45	17.1%
	51 - 100 Employees	57	21.6%
	101 - 500 Employees	83	31.4%
	501 - 1,000 Employees	32	12.1%
	1,001 - 10,000 Employees	33	12.5%
	More than 10,000 Employees	14	5.3%
Age Group	20 or below	8	3%
	21-30	114	43.2%
	31-40	58	22%
	41-50	52	19.7%
	51-60	27	10.2%
	Over 60	5	1.9%
Gender	Female	117	44.3%
	Male	147	55.7%
Country of Residence	South Africa	101	38.3%
	United States of America	56	21.2%
	United Kingdom	48	18.2%
	Other Countries	59	22.3%
Sector	Information Technology and Telecommunications	172	65.2%
	Banking and Finance	27	10.2%
	Retailing	15	5.7%
	Professional Services	15	5.7%
	Manufacturing and Construction	15	5.7%
	Others	20	7.5%

Cont. Table 3
Demographic Profile of Participants

Item	Group	Number	Percentage
Current Role	Manager	129	48.9%
	Software Developer	33	12.5%
	Analyst	32	12.1%
	IT Professional	14	5.3%
	Executive	13	5%
	IT Manager	10	3.8%
	Administrator	9	3.4%
	Others	24	9%

Does your company provide systems or software that has Artificial Intelligence (AI) capabilities to be used in your work?

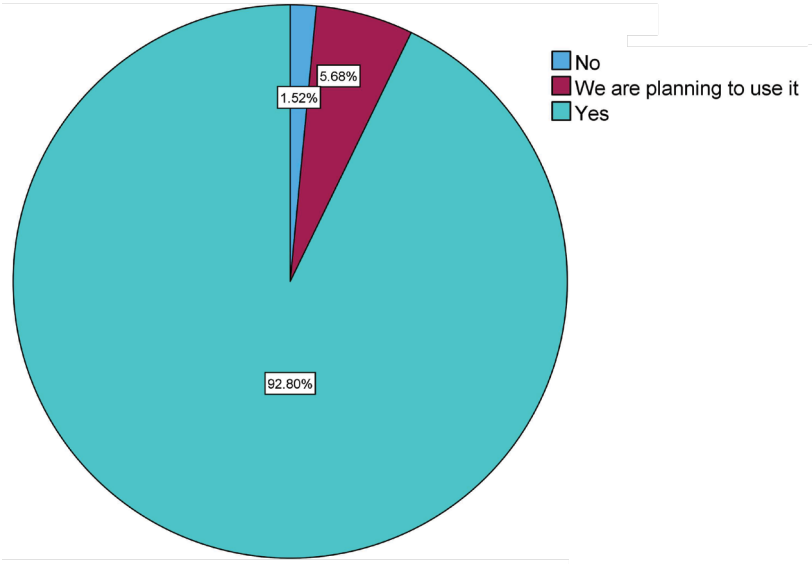

Figure 2: The Usage of BIS with AI Capabilities at Work

Table 4 presents the areas or business functions where AI capabilities are applied. The top three functions, in order, are service operations, product or service development, and marketing and sales. The table also shows that almost 71.6% of participants use AI capabilities in service operations, products and/or servic-

es development, and marketing and sales. Figure 3 illustrates the frequency of AI usage at work, indicating that nearly 66% of participants use AI capabilities on a daily basis.

Table 4
Business Functions where AI Capabilities are Used

In which area or business function do you use systems or software that have AI capabilities?		
	Frequency	**Percent**
Manufacturing	10	3.8
Risk management	11	4.2
Supply chain management	16	6.1
Strategy and corporate finance	38	14.4
Marketing and sales	58	22.0
Product and/or service development	64	24.2
Service operations	67	25.4
Total	**264**	**100**

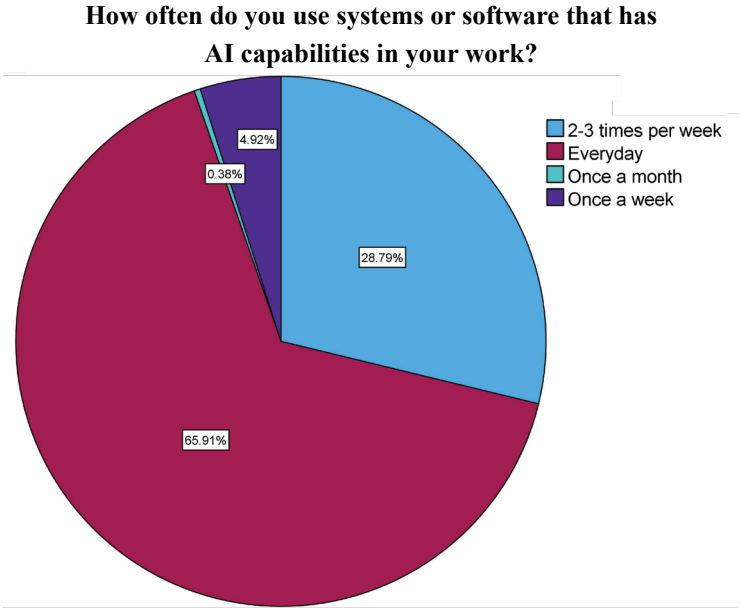

Figure 3: Frequency of AI Capability Use at Work

Using AI capabilities to support managerial and strategic decisions appears to be a common practice among participants. As shown in Table 5, nearly 81% rely on AI-generated output to inform decisions related to their work activities. Figure 4 indicates that almost half of the participants use generative AI models (e.g., ChatGPT) in their work. Figure 4 also shows almost 33% use data analytics tools (e.g., Power BI) as part of their AI capabilities to support their job functions.

Table 5
The Use of AI to Guide Decisions

Do you use the output of AI-enabled systems or software to guide your work-related decisions?		
	Frequency	**Percent**
No	8	3.0
We are planning to use AI capabilities to guide our work-related decisions	41	15.5
Yes	215	81.4
Total	**264**	**100**

What are the AI capabilities that you use in your work?

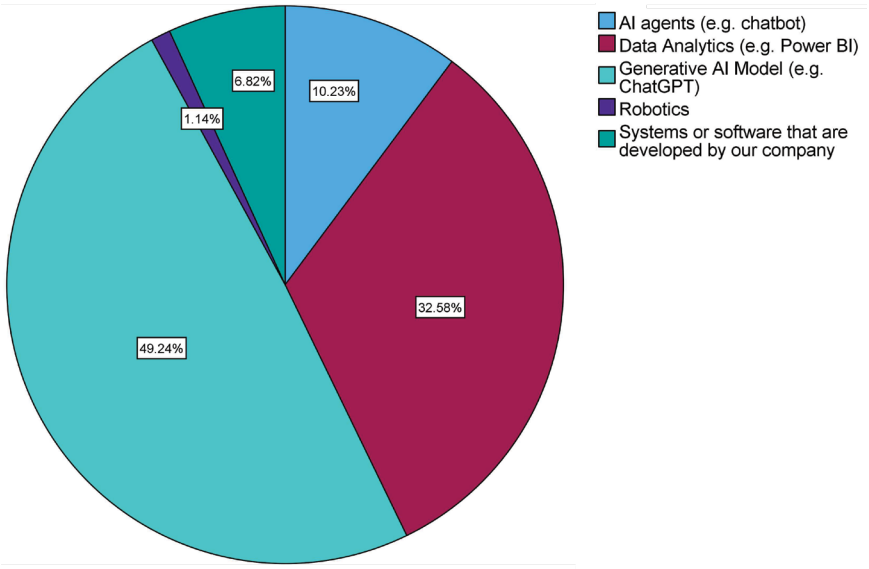

Figure 4: AI Capabilities Used

Participants were asked about their current experience with methods used to develop AI capabilities in their companies. Table 6 illustrates that e-commerce businesses adopt varied approaches to developing their own AI-enabled systems or software. Table 6 shows that 37.9% reported that their companies purchase ready-packaged software with built-in AI capabilities for employee use, 36% indicated that their companies develop such capabilities in-house, and 26.1% stated that their companies outsource the development of AI systems or software to external vendors.

Table 6
Current AI Capabilities Development Method

How did your company develop systems or software that have AI capabilities?		
	Frequency	**Percent**
Outsourced to vendors	69	26.1
Developed in-house	95	36.0
Purchase a commercial solution	100	37.9
Total	**264**	**100**

Identifying best practices for AI capabilities development is one of the main objectives of this research. When participants were asked about their personal preferences and recommendations regarding methods for developing AI capabilities systems or software, nearly 56% indicated a preference for in-house development, as shown in Table 7.

Table 7
Recommended AI Capabilities Systems Development Method

In your opinion, how should companies develop systems or software that have AI capabilities to maintain competitive advantage?		
	Frequency	**Percent**
Outsourced to vendors	58	22.0
Purchase a commercial solution	58	22.0
Developed the system in-house	148	56.1
Total	**264**	**100**

Participants were also asked about their companies' current practices regarding AI capabilities development, specifically the use of real business data during the training phase of AI systems or software. As shown in Table 8, approximately 51% indicated that their companies use real business data to train AI systems or software. In addition, about 27% reported that their companies employ pre-built AI systems or software packages that do not require AI training or machine learning and are ready for immediate use. On the other hand, around 18% stated that their companies use dummy data for training the AI systems or software during the development phase.

Table 8
Current Training Practice for AI Capabilities Development

How did your company deal with training systems or software that have AI capabilities (machine learning) during the development of the system?		
	Frequency	**Percent**
No training to the system was preformed	11	4.2
We used dummy data to train the system	48	18.2
We used a ready system that does not require AI training or machine learning	71	26.9
We used real data to train the system	134	50.8
Total	**264**	**100**

To further explore best practices in the development of AI capabilities systems or software, participants were asked to share their personal preferences and recommendations regarding AI training-specifically, the use of real business data during the development phase. As shown in Figure 5, nearly 57% of participants recommended using real business data to train the new AI systems or software during development. On the other hand, approximately 24% suggested utilizing pre-built AI systems or software packages that do not require additional training or machine learning and are ready for immediate deployment. Meanwhile, about 15% recommended using dummy data for training purposes during the development stage.

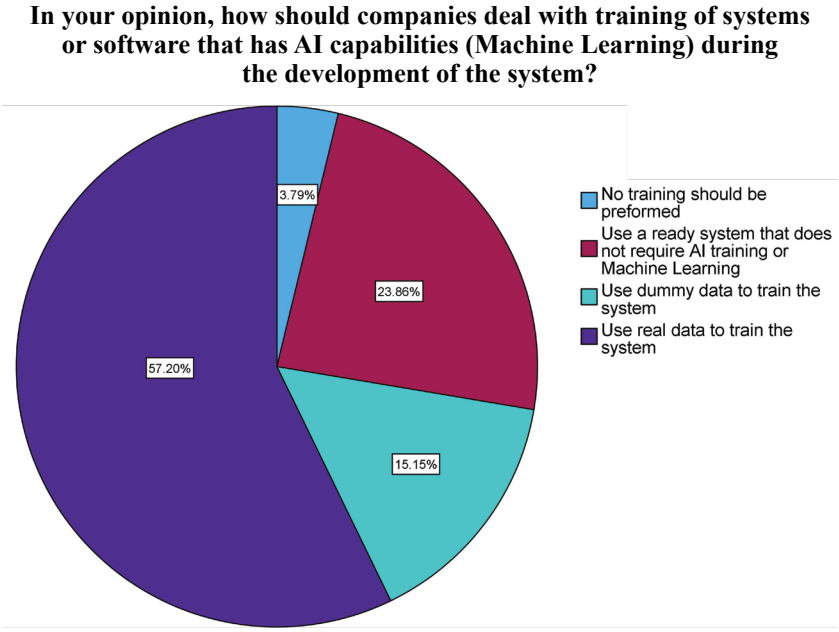

Figure 5: Recommended Training Practice for AI Capabilities Development

Table 9 presents the participants' personal preferences and recommendations regarding best practices for developing AI capabilities systems or software. Specifically, if such systems or software are developed through specialized AI vendors, the question focused on whether real business data should be shared for training purposes during the development stage. Nearly 37% of participants preferred not to disclose real business data to AI vendors, while an additional 30% did not recommend sharing real business data with AI vendors.

Table 9
Share Real Business Data with AI Vendors

If companies develop systems or software that have AI capabilities through vendors, should they share their real business data with AI vendors?		
	Frequency	**Percent**
No	80	30.3
Yes	85	32.2
Prefer not to disclose real business data with AI vendors	99	37.5
Total	**264**	**100**

Participants were also asked to identify potential risks that may arise during the development of AI capabilities if such systems or software are developed through specialized AI vendors and real business data is shared for the training purposes of these new systems or software. The question posed was: "If companies develop systems or software with AI capabilities through vendors and share their real business data with AI vendors, what are the possible risks that might occur? Please select all that apply". Table 10 presents the responses to this question and the frequency with which each risk was selected. The top concerns identified by participants included data privacy issues, loss of business data and trade secrets, cyber-attacks, and data breaches.

Table 10
Possible Risks for Sharing Real Business Data with AI Vendors

Possible Risks	Counts
Data privacy issues	220
Loss of business data and secrets	170
Cyber attacks	160
Data breaches	160
Loss of competitive advantage	130
Loss of control	110

The final question in the second part of the survey was: "What are the best practices among e-commerce businesses for the utilization of current business data for AI training (machine learning) during the development of systems or software with AI capabilities?" This question was designed to address the third research question and provided several insights into best practices. First, respondents emphasized the importance of businesses defining clear objectives, goals, and use cases for the new AI system or software, ensuring these align with the strategic goals of the organization. Additionally, businesses should articulate how the AI system will create value for the organization and specify the purpose of using real business data for developing AI capabilities. This clarity will help in selecting the appropriate data that directly relates to the systems used for training purposes.

Many participants suggested that the data used for AI training should be divided into three sets: training, validation, and testing datasets. They also outlined

several essential steps in the data preparation process for AI system development. These include:

- Data preparation, which involves ensuring data quality through cleaning and transformation.
- Data selection, based on criteria such as relevance, representativeness, and diversity.
- Data protection and governance, encompassing practices like data anonymization, encryption, and access control.

Participants also emphasized the need for businesses to provide scalable infrastructure for handling large datasets and to create efficient pipelines for transferring data across systems. Moreover, they recommended augmenting business data with information from external sources. Many participants noted the importance of converting data into appropriate formats for AI algorithms and emphasized that data normalization is essential to scale the data and prevent feature dominance. Lastly, they acknowledged that data labeling and annotation are critical for supervised learning models.

Overall, participants agreed that businesses should adhere to industry best practices as well as security, regulatory, and ethical standards in the development of AI systems or software. Leveraging current business data for training AI systems requires a careful balance between technical efficiency, ethical responsibility, and regulatory compliance. To ensure data security and governance, companies must implement data encryption, access controls, and robust data governance policies. Compliance with data privacy and protection regulations is essential, which includes anonymizing and aggregating sensitive information to maintain confidentiality and prevent unauthorized disclosure. Proper procedures should be established to remove personal or sensitive information from the training data, ensuring that such data is never exposed to AI tools. Moreover, when AI system development is outsourced to vendors, companies should sign confidentiality agreements, retain full ownership of the data, and constantly monitor and audit the development process.

Finally, participants emphasized that high-quality data significantly enhances an AI system's or software model's ability to learn effectively and produce reliable outputs. The criteria for high-quality data include accuracy, cleanliness, consistency, relevance, diversity, completeness, and representativeness. These at-

tributes collectively reflect participants' views on what constitutes best practices for training data during the development of new AI systems within e-commerce businesses. The remainder of this section addresses the fourth research question and presents the results of testing the three proposed hypotheses.

Exploratory Factor Analysis

The analysis began with an exploratory factor analysis (EFA) using SPSS to assess the correlations among items within each construct in the research model presented in Figure 1. Generalized least squares was used as the extraction method, while Promax rotation with Kaiser normalization was used to measure the unique relationships between each item and the constructs. Results from the first round of EFA revealed that two items did not load onto any construct. Consequently, these two items were removed, and the EFA was conducted again. Table 11 presents the results of the second round of EFA, including the item loadings for each construct.

Table 11
EFA Results – Second Round

Items	Factor			
	1	2	3	4
TC1	0.674			
TC2	0.687			
TC3	0.639			
TC4	0.845			
TC5	0.645			
TC6	0.772			
TC7	0.768			
TC8	0.445			
TC9	0.506			
TC10	0.383			
OC1			0.376	
OC2			0.490	
OC3			0.525	
OC4			0.703	
OC5			0.453	
OC6			0.548	

Cont. Table 11
EFA Results – Second Round

Items	Factor			
	1	2	3	4
ETE2		0.453		
ETE3		0.817		
ETE4		0.916		
ETE5		0.874		
ETE6		0.632		
AIA1				0.429
AIA2				0.581
AIA3				0.705
AIA4				0.741
AIA5				0.726

To assess the sampling adequacy for the EFA, the Kaiser-Meyer-Olkin test was performed, yielding a value of 0.924, which is acceptable (Field, 2013; Kaiser, 1974). In addition, reliability tests were performed on the research instrument and its items. The analysis revealed a Cronbach's alpha value of 0.936 for the entire instrument comprising 26 items, which is acceptable, as recommended by Field (2013). Therefore, the research instrument is considered a reliable measure (see Table 12 for more details).

Table 12
Reliability Test for the Data Collection Instrument and the Items Used

Test for	Cronbach's Alpha Value	Number of Items
The whole instrument	0.936	26
Technology characteristics (TC)	0.905	10
Organizational capabilities (OC)	0.881	6
External task environment (ETE)	0.852	5
Artificial intelligence adoption (AIA)	0.780	5

Structural Equation Modeling (SEM)

Confirmatory factor analysis (CFA) was conducted using AMOS to validate the factor structure of the dataset. The process began with model construction and the integration of the collected data into the specified model. The results of the CFA are presented in Table 13.

Table 13
CFA Analysis Results (Hair et al., 2010; Hu & Bentler, 1999)

Measure	Value	Threshold and Comments
Chi-square/df (CMIN/DF)	1.687	< 3, good
p-value for the model	0.000	> 0.05
CFI	0.946	> 0.90 acceptable, > 0.95 good fit
IFI	0.947	> 0.90 acceptable, > 0.95 good fit
TLI	0.938	> 0.90 acceptable, > 0.95 good fit
RMSEA	0.051	< 0.05, good; 0.05-0.10, moderate
PCLOSE	0.399	> 0.05

Convergent and discriminant validity tests were conducted to assess the validity of the CFA results. These tests involved calculating the composite reliability (CR), average variance extracted (AVE), maximum shared variance (MSV), and average shared variance (ASV). As shown in Table 14, two convergent and discriminant validity concerns were identified and are highlighted in red: the AVE and AIA for TC values are below 0.50. Furthermore, multicollinearity was assessed using the variance inflation factor (VIF), and the results for all constructs were below 5, which is acceptable (Hair et al., 2010).

Table 14
The Results of Convergent and Discriminant Validity Tests for the Research Model

	CR	AVE	MSV	MaxR(H)	OC	ETE	AIA	TC
OC	0.890	0.575	0.506	0.893	0.758			
ETE	0.861	0.561	0.506	0.900	0.711	0.749		
AIA	0.778	0.420	0.348	0.805	0.512	0.406	0.648	
TC	0.895	0.461	0.446	0.899	0.668	0.651	0.590	0.679

Path analysis (PA) testing was subsequently conducted using AMOS to evaluate the model structure and test the research hypotheses. Table 15 presents the results of the hypotheses testing. H1 and H2 were supported, while H3 was not supported. The following section discusses these results and their implications.

Table 15
Hypotheses Testing Results

Hypotheses	From	To	S.E.	C.R.	*p*-value	Hypothesis Support
H1	TC	AIA	0.073	3.887	***	YES
H2	OC	AIA	0.068	2.279	0.023	YES
H3	ETE	AIA	0.079	-0.796	0.426	NO

Discussion and Implications

The first research question asked: "How do e-commerce businesses deal with current data usage for AI training during the development of BIS that have AI capabilities?" The second was: "Should e-commerce businesses share their data with AI vendors, or should they develop BIS with AI capabilities internally to maintain a competitive advantage?" The first question pertains to current practices, whereas the second focuses on identifying best practices.

Some participants reported that their companies use real business data to train AI systems or software, while others stated that their companies use dummy data. The use of real business data is a common practice among companies aiming to develop high-quality AI systems. According to Whang et al. (2023), quality data is essential for machine learning-no matter how advanced the algorithms, they cannot function effectively without reliable input. Real business data can be used to train new AI systems, provided that proper data governance policies are established and enforced. When development is outsourced, a well-defined contract must be in place to protect the shared data. According to Panian (2010), data governance involves data quality management, data stewardship, data architecture, and data privacy and security. Indeed, implementing a comprehensive data governance framework is essential for addressing data quality challenges in AI system development (Aldoseri et al., 2023). Additionally, anonymizing and removing sensitive information to maintain privacy and security should be performed before using the data for AI training purposes. Such a practice reduces the risk of breaching customer privacy.

When participants were asked about best practices for developing AI capabilities, many expressed a preference for in-house development. Additionally, many recommended the use of real business data during this phase to train AI systems. On the other hand, when AI systems or software were developed by specialized AI vendors, many preferred not to disclose real business data to these AI vendors. Participants cited several potential risks associated with sharing business data with AI vendors, including data privacy concerns, loss of proprietary information, cyber-attacks, and data breaches. These concerns have been highlighted by many researchers (Dwivedi et al., 2021; Gupta et al., 2024; Jakkula, 2022).

The third research question was "What are the best practices among e-commerce businesses for the utilization of current business data for AI training (machine learning) during the development of systems or software with AI capabilities?" We can conclude that e-commerce companies should establish a clear purpose for AI capabilities development, as this will help them devise the most effective development strategy. Participants recommended several specific and optimal practices during the development of the new AI systems:

- Divide the data intended for training purposes into training, validation, and testing datasets. As part of the training process, include steps for data preparation, data selection, and data protection and governance.
- Provide scalable infrastructure capable of handling large datasets, convert data into formats suitable for AI algorithms, and implement robust data labeling and annotation procedures.
- Follow industry best practices, with particular attention to security, regulatory compliance, and ethical standards in AI systems or software development.
- Implement and enforce data encryption, access controls, and data governance policies. Anonymize and aggregate sensitive information to maintain privacy and security. Do not disclose any sensitive information to AI tools.
- Ensure that only high-quality data is used in training the new AI system, enhancing the model's ability to learn effectively and produce reliable outcomes.

According to Whang et al. (2023), gathering the right data and improving its quality is becoming increasingly critical for the development of AI systems. They propose data management techniques such as data collection, cleaning, validation, and integration, all of which contribute to more robust training approaches. To address data quality challenge, Aldoseri et al. (2023) outline a comprehensive process

for data-driven AI, encompassing data collection, data preparation, machine learning, model validation, model deployment, and continuous improvement.

Finally, the fourth research question posed was: "Do technology characteristics, organizational capabilities, and the external task environment affect AI adoption within e-commerce businesses?". As demonstrated by the results above, H1 and H2 were supported. This suggests that AI technology characteristics and organizational capabilities have a significant positive influence on AI adoption in e-commerce businesses. Based on these findings, e-commerce firms can make informed decisions when adopting AI solutions that align with their strategic goals and operational needs. These results are consistent with the findings of Ronaghi (2023), with the exception of H3, which was not supported in the current study. The ETE construct in H3 includes competitive pressure, government policy and the regulatory environment, and support from software vendors. The results indicate that this construct does not have a significant positive effect on the adoption of AI systems within e-commerce businesses. This may be attributed to the notion that the external environment holds less importance to e-commerce businesses, as they operate globally in a highly competitive market. Additionally, many e-commerce companies are technology-driven organizations that adhere to the software-as-a-service (SaaS) model. As such, they offer advanced, high-performance systems that are primarily developed by highly skilled personnel within the company. These distinct characteristics of the e-commerce sector differ from the context explored by Ronaghi (2023), which focused on manufacturing industries implementing circular economy practices.

Conclusion

With the global rise of e-commerce, businesses are under increasing pressure to deliver an optimal customer experience to consumers using their online portals to purchase products or services. The development of these portals using AI systems or software has become a priority for many e-commerce businesses. However, they face several challenges in this process-one of which involves providing real business data to AI system or software vendors for training purposes. This study explores how businesses manage the issue of sharing real business data with vendors, treating it as a vital resource for training AI systems or software, in line with current best practices. The research contributes to the literature by identifying best practices in developing AI systems or software for use by e-commerce businesses, while also examining factors that may influence the adoption of such technologies within the sector.

This study's findings are consistent with previous research, which highlights key challenges in AI implementation such as data privacy concerns, the loss of business data and trade secrets, cyber-attacks, data breaches, and the erosion of competitive advantage and control. To address these challenges, e-commerce businesses should enforce robust governance policies and establish comprehensive contracts to protect shared data. These agreements should include provisions to anonymize and remove sensitive information to ensure privacy and security before the data is used for AI training. Furthermore, the current study demonstrates that AI technology characteristics and organizational capabilities have a significant positive impact on the adoption of new AI systems or software within e-commerce businesses.

Limitations and Directions for Future Research

This research is exploratory in nature and carries certain limitations. One such limitation is the relatively small sample size. Additionally, the study focuses solely on businesses that sell products or services online. Future research could replicate this study and evaluate the constructs influencing the adoption of new AI systems or software in different contexts or target other market segments.

References

Agarwal, P., Swami, S., & Malhotra, S. K. (2024). Artificial intelligence adoption in the post COVID-19 new-normal and role of smart technologies in transforming business: A review. *Journal of Science and Technology Policy Management*, *15*(3), 506–529. https://doi.org/10.1108/JSTPM-08-2021-0122

Ahmad, K., Abdelrazek, M., Arora, C., Bano, M., & Grundy, J. (2023). Requirements engineering for artificial intelligence systems: A systematic mapping study. *Information and Software Technology*, *158*, 107176. https://doi.org/10.1016/j.infsof.2023.107176

Aldoseri, A., Al-Khalifa, K., & Hamouda, A. (2023). Re-thinking data strategy and integration for artificial intelligence: Concepts, opportunities, and challenges. *Applied Sciences*, *13*(12), 7082. https://doi.org/10.3390/app13127082

Ayyapparajan, R. A., & Sabeena, S. (2022). Impact of artificial intelligence in e-commerce. *Journal of University of Shanghai for Science and Technology*, *24*(8), 315–321. https://jusst.org/wp-content/uploads/2022/08/IMPACT-OF-ARTIFICIAL-INTELLIGENCE-IN-E-COMMERCE.pdf

Barata, S. F. P. G., Ferreira, F. A. F., Carayannis, E. G., & Ferreira, J. J. M. (2024). Determinants of e-commerce, artificial intelligence, and agile methods in small- and medium-sized enterprises. *IEEE Transactions on Engineering Management*, *71*, 6903–6917. https://doi.org/10.1109/TEM.2023.3269601

Bawack, R. E., Wamba, S. F., Carillo, K. D. A., & Akter, S. (2022). Artificial intelligence in e-commerce: A bibliometric study and literature review. *Electronic Markets*, *32*(1), 297–338. https://doi.org/10.1007/s12525-022-00537-z

Bisht, S., Sengupta, S., & Kumar Bisht, M. (2024). Adoption of artificial intelligence in business operations of technology firms. In G. Fortino, A. Kumar, A. Swaroop, & P. Shukla (Eds.), *Proceedings of 3rd International Conference on Computing and Communication Networks. ICCCN 2023* (Lecture Notes in Networks and Systems, Vol. 917, pp. 543–555). Springer, Singapore. https://doi.org/10.1007/978-981-97-0892-5_49

Borges, A. F. S., Laurindo, F. J. B., Spínola, M. M., Gonçalves, R. F., & Mattos, C. A. (2021). The strategic use of artificial intelligence in the digital era: Systematic literature review and future research directions. *International Journal of Information Management*, *57*, 102225. https://doi.org/10.1016/j.ijinfomgt.2020.102225

Boukrouh, I., & Azmani, A. (2024). Artificial intelligence applications in e-commerce: A bibliometric study from 1995 to 2023 using merged data sources. *International Journal of Professional Business Review*, *9*(4), e4537. https://doi.org/10.26668/businessreview/2024.v9i4.4537

Chen, Y., Hu, Y., Zhou, S., & Yang, S. (2023). Investigating the determinants of performance of artificial intelligence adoption in hospitality industry during COVID-19. *International Journal of Contemporary Hospitality Management*, *35*(8), 2868–2889. https://doi.org/10.1108/IJCHM-04-2022-0433

Cheng, X., Cohen, J., & Mou, J. (2023). AI-enabled technology innovation in e-commerce. *Journal of Electronic Commerce Research, 24*(1), 1–6. https://www.jecr.org/node/674

Comscore. (2024). *Comscore's 2024 state of digital commerce report*. Comscore. https://www.comscore.com/Insights/Presentations-and-Whitepapers/2024/2024-State-of-Digital-Commerce-Report

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., Medaglia, R., & Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, *57*, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

Erdogan, U. (2023). A systematic review on the use of artificial intelligence in e-commerce. *Journal of Society, Economics and Management*, *4*, 184–197. https://doi.org/10.58702/teyd.1357551

EU Commission. (2020). *White paper on artificial intelligence - A European approach to excellence and trust*. Brussels: European Commission. Retrieved from https://commission.europa.eu/publications/white-paper-artificial-intelligence-european-approach-excellence-and-trust_en

Fatima, S. (2023). AI implementation in an e-commerce. *International Journal for Multidisciplinary Research*, *5*(6), 1–11. https://doi.org/10.36948/ijfmr.2023.v05i06.8605

Fedorko, R., Kráľ, Š., & Bačík, R. (2022). Artificial intelligence in e-commerce: A literature review. In M. Saraswat, H. Sharma, K. Balachandran, J. H. Kim, & J. C. Bansal (Eds.), *Congress on intelligent systems* (Lecture Notes on Data Engineering and Communications Technologies, Vol. 111, pp. 677–689). Springer, Singapore. https://dx.doi.org/10.1007/978-981-16-9113-3_50

Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). SAGE.

Gochhait, S., Mazumdar, O., Chahal, S., & Kanwat, P., Gupta, S., Sharma, R., Pandit, V., Brahma, R., & Sachan, R. (2020). Role of artificial intelligence (AI) in understanding the behavior pattern: A study on e-commerce. In *ICDSMLA 2019, Proceedings of the 1st International Conference on Data Science, Machine Learning and Applications* (Lecture Notes in Electrical Engineering, Vol. 615, pp. 1600–1606). Springer. https://doi.org/10.1007/978-981-15-1420-3_166

Gupta, C. P., Ravi Kumar, V. V., & Khurana, A. (2024). Artificial intelligence application in e-commerce: Transforming customer service, personalization and marketing. In *2024 11th International Conference on Computing for Sustainable Global Development (INDIACom)* (pp. 10–16). IEEE. https://doi.org/10.23919/INDIACom61295.2024.10498474

Gururaj, P. (2021). Artificial intelligence application in the field of e-commerce. *International Journal of Research*, *9*(4), 170–177. https://doi.org/10.29121/granthaalayah.v9.i4.2021.3849

Hacker, P. (2021). A legal framework for AI training data—From first principles to the Artificial Intelligence Act. *Law, Innovation and Technology*, *13*(2), 257–301. https://doi.org/10.1080/17579961.2021.1977219

Haidar, I. (2024). Artificial intelligence's role in e-commerce: Applications and impact. *Journal of Artificial Intelligence General Science*, *1*(1), 181–187. https://doi.org/10.60087/jaigs.v1i1.152

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Prentice Hall.

Harshitha, K. S., Monisha, G., & Manjunatha, K. R. (2024). A study on role of artificial intelligence in the field of e-commerce. *International Journal for Multidisciplinary Research*, *6*(4), 1–5. https://www.ijfmr.com/papers/2024/4/24712.pdf

Hassan, A., & Abdulkhaleq, N. M. S. (2022). The use of artificial intelligence in the field of electronic commerce. In A. M. A. Musleh Al-Sartawi (Ed.), *Artificial intelligence for sustainable finance and sustainable technology. ICGER 2021* (Lecture Notes in Networks and Systems, Vol. 423, pp. 203–216). Springer, Cham. https://doi.org/10.1007/978-3-030-93464-4_21

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Jakkula, A. R. (2022). Challenges in implementing AI in e-commerce and how to overcome them. *Journal of Artificial Intelligence & Cloud Computing, 1*(4), 1–3. https://doi.org/10.47363/JAICC/2022(1)286

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, *39*(1), 31–36. https://doi.org/10.1007/BF02291575

Kar, A. K., & Kushwaha, A. K. (2023). Facilitators and barriers of artificial intelligence adoption in business– Insights from opinions using big data analytics. *Information Systems Frontiers*, *25*, 1351–1374. https://doi.org/10.1007/s10796-021-10219-4

Kashyap, A., Sahu, I., & Kumar, A. (2022). Artificial intelligence and its applications in e-commerce: A review analysis and research agenda. *Journal of Theoretical and Applied Information Technology*, *100*(24), 7347–7365. https://www.jatit.org/volumes/Vol100No24/12Vol100No24.pdf

Khrais, L. T. (2020). Role of artificial intelligence in shaping consumer demand in e-commerce. *Future Internet*, *12*(12), 226. https://doi.org/10.3390/fi12120226

Kuo, C., & Li, Z. (2014). Supply chain analytics in the era of big data. In J. Wang (Ed.), *Encyclopedia of business analytics and optimization* (pp. 2350–2363). IGI Global. https://doi.org/10.4018/978-1-4666-5202-6.ch211

Lari, H. A., Vaishnava, K., & S., M. K. (2022). Artificial intelligence in e-commerce: Applications, implications and challenges. *Asian Journal of Management*, *13*(3), 235–244. https://doi.org/10.52711/2321-5763.2022.00041

Madiega, T. (2023). *Artificial intelligence liability directive*. European Parliamentary Research Service. Retrieved from https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/739342/EPRS_BRI(2023)739342_EN.pdf

Marjerison, R. K., Zhang, Y., & Zheng, H. (2022). AI in e-commerce: Application of the use and gratification model to the acceptance of Chatbots. *Sustainability 14*(21), 14270. https://doi.org/10.3390/su142114270

Maslej, N., Fattorini, L., Perrault, R., Parli, V., Reuel, A., Brynjolfsson, E., Etchemendy, J., Ligett, K., Lyons, T., Manyika, J., Niebles, J. C., Shoham, Y., Wald, R., & Clark, J. (2024). *The AI Index 2024 annual report*. Stanford University. https://hai.stanford.edu/ai-index/2024-ai-index-report

Merhi, M. I., & Harfouche, A. (2024). Enablers of artificial intelligence adoption and implementation in production systems. *International Journal of Production Research*, *62*(15), 5457–5471. https://doi.org/10.1080/00207543.2023.2167014

Micu, A., Micu, A. E., Geru, M., Căpățînă, A., & Muntean, M. C. (2021). The impact of artificial intelligence use on the e-commerce in Romania. *Amfiteatru Economic*, *23*(56), 137–154. https://doi.org/10.24818/EA/2021/56/137

Mikalef, P., Fjørtoft, S. O., & Torvatn, H. Y. (2019). Developing an artificial intelligence capability: A theoretical framework for business value. In W. Abramowicz & R. Corchuelo (Eds.), *Business information systems workshops. BIS 2019* (Lecture Notes in Business Information Processing, Vol. 373, pp. 449–460). Springer, Cham. https://doi.org/10.1007/978-3-030-36691-9_34

Mikalef, P., & Gupta, M. (2021). Artificial intelligence capability: Conceptualization, measurement calibration, and empirical study on its impact on organizational creativity and firm performance. *Information & Management*, *58*(3), 103434. https://doi.org/10.1016/j.im.2021.103434

Necula, S.-C., & Pavaloaia, V.-D. (2023). AI-driven recommendations: A systematic review of the state of the art in e-commerce. *Applied Sciences*, *13*(9), 5531 https://doi.org/10.3390/app13095531

Nti, I. K., Boateng, S., Quarcoo, J. A., & Nimbe, P. (2023). Artificial intelligence application in law: A scientometric review. *Artificial Intelligence and Applications*, *2*(1), 1–10. https://doi.org/10.47852/bonviewAIA3202729

Pallathadka, H., Ramirez-Asis, E. H., Loli-Poma, T. P., Kaliyaperumal, K., Ventayen, R. J. M., & Naved, M. (2023). Applications of artificial intelligence in business management, e-commerce and finance. *Materials Today: Proceedings*, *80*, 2610–2613. https://doi.org/https://doi.org/10.1016/j.matpr.2021.06.419

Panian, Z. (2010). Some practical experiences in data governance. *World Academy of Science, Engineering and Technology*, *62*(1), 939–946. https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=173626431ed114b232c1dab8ae60a005a0d593dc

Pankowska, M. (2015). Creativity of end users in theory and in practice. In M. Khosrow-Pour (Ed.), *Encyclopedia of information science and technology* (3rd ed.). IGI Global. https://doi.org/10.4018/978-1-4666-5888-2.ch402

Pillai, R., & Sivathanu, B. (2020). Adoption of artificial intelligence (AI) for talent acquisition in IT/ITeS organizations. *Benchmarking: An International Journal*, *27*(9), 2599–2629. https://doi.org/10.1108/BIJ-04-2020-0186

Prabha, J. (2021). A study on impact of artificial intelligence in e-commerce. *International Journal of Creative Research Thoughts*, *9*(9), 24–28. https://ijcrt.org/papers/IJCRTG020005.pdf

PwC. (2020). *PwC's global artificial intelligence study: Sizing the prize*. PwC. https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html

Rahman, M., Ming, T. H., Baigh, T. A., & Sarker, M. (2023). Adoption of artificial intelligence in banking services: An empirical analysis. *International Journal of Emerging Markets*, *18*(10), 4270–4300. https://doi.org/10.1108/IJOEM-06-2020-0724

Rashidin, M. S., Gang, D., Javed, S., & Hasan, M. (2021). The role of artificial intelligence in sustaining the e-commerce ecosystem: Alibaba vs. Tencent. *Journal of Global Information Management*, *30*(8), 1–25. https://doi.org/10.4018/JGIM.304067

Rath, K., Muduli, K., Das, R., Ramasamy, A., & Mohammed, A. (2022). Disruptive technology-enabled circular economy for improving the sustainability of the supply chain: A case of an emerging economy. In Y. Ramakrishna (Ed.), *Handbook of research on supply chain resiliency, efficiency, and visibility in the post-pandemic era* (pp. 335–351). IGI Global. https://doi.org/10.4018/978-1-7998-9506-0.ch017

Rawashdeh, A., Bakhit, M., & Abaalkhail, L. (2023). Determinants of artificial intelligence adoption in SMEs: The mediating role of accounting automation. *International Journal of Data and Network Science*, *7*, 25–34. https://doi.org/10.5267/j.ijdns.2022.12.010

Ronaghi, M. H. (2023). The influence of artificial intelligence adoption on circular economy practices in manufacturing industries. *Environment, Development and Sustainability*, *25*(12), 14355–14380. https://doi.org/10.1007/s10668-022-02670-3

Saleem, S. A. M., & Naseem, S. M. B. (2023). A comprehensive review of the artificial intelligence (AI) shift in e-commerce. In *2023 6th International Conference on Advances in Science and Technology (ICAST)* (pp. 51–56). IEEE. https://doi.org/10.1109/ICAST59062.2023.10454937

Sharda, R., Delen, D., & Turban, E. (2021). *Analytics, data science, & artificial intelligence systems for decision support* (11th ed.). Pearson.

Shyna, K., & Vishal, M. (2017). A study on artificial intelligence in e-commerce. *International Journal of Advances in Engineering & Scientific Research*, *4*(4), 62–68. https://doi.org/10.5281/zenodo.1123241

Song, X., Yang, S., Huang, Z., & Huang, T. (2019). The application of artificial intelligence in electronic commerce. *Journal of Physics: Conference Series, 1302*(3), 032030.https://doi.org/10.1088/1742-6596/1302/3/032030

Soni, V. D. (2020). Emerging roles of artificial intelligence in e-commerce. *International Journal of Trend in Scientific Research and Development*, *4*(5), 223–225. https://www.ijtsrd.com/papers/ijtsrd31768.pdf

Sunyaev, A., Dehling, T., Strahringer, S., Da Xu, L., Heinig, M., Perscheid, M., Alt, R., & Rossi, M. (2023). The future of enterprise information systems. *Business & Information Systems Engineering*, *65*(6), 731–751. https://doi.org/10.1007/s12599-023-00839-2

Tang, Y. M., Chau, K. Y., Lau, Y.-Y., & Zheng, Z. (2023). Data-intensive inventory forecasting with artificial intelligence models for cross-border e-commerce service automation. *Applied Sciences*, *13*(5), 3051. https://doi.org/10.3390/app13053051

Tran, D. T., & Huh, J.-H. (2023). New machine learning model based on the time factor for e-commerce recommendation systems. *The Journal of Supercomputing*, *79*(6), 6756–6801. https://doi.org/10.1007/s11227-022-04909-2

Whang, S., Roh, Y., Song, H., & Lee, J.-G. (2023). Data collection and quality challenges in deep learning: A data-centric AI perspective. *The International Journal on Very Large Data Bases*, *32*, 791–813. https://doi.org/10.1007/s00778-022-00775-9

Zhang, X., Guo, F., Chen, T., Pan, L., Beliakov, G., & Wu, J. (2023). A brief survey of machine learning and deep learning techniques for e-commerce research. *Journal of Theoretical and Applied Electronic Commerce Research*, *18*(4), 2188–2216. https://doi.org/10.3390/jtaer18040110

Husam Alfahl is an Associate Professor in the Management Information System Department, College of Business Administration, Taibah University, Al-Madinah, Kingdom of Saudi Arabia. He worked as a consultant in development and digital transformation in several organizations. He is a TOGAF certified professional as well as PROSCI certified professional. He holds a BSc in Management Information Systems from KFUPM in Saudi Arabia, Master in business administration/Master in information technology from The University of Newcastle in Australia, and Ph. D. in Management Information Systems from Griffith University in Australia. His research interest includes Information Technology Adoption, Electronic Commerce, Management Information Systems, ERP, Mobile Business, and Enterprise Architecture. (hfahl@taibahu.edu.sa)

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The author declare that there are no conflicts of interest related to this work. All research data and materials supporting the findings of this study are available upon reasonable request.