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MULTI-CRITERIA DECISION ANALYSIS OF E-COMMERCE SOFTWARE SELECTION USING AHP-NWA HYBRID MODEL

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Abstract. In the digital economy, selecting the right e-commerce platform is a strategic decision with significant implications for efficiency and competitiveness. This paper applies a hybrid decision-making framework that integrates the Analytic Hierarchy Process (AHP) and Net Worth Analysis (NWA) to evaluate five popular e-commerce platforms: Magento, WooCommerce, Shopify, PrestaShop, and OpenCart. AHP was used to derive weights for evaluation criteria, while NWA incorporated expert assessments of alternatives. Results indicate that security (32%) and functionality (25%) are the most critical factors, followed by maintenance costs (14%) and scalability (11%). The ranking shows Magento as the leading platform (0.575), excelling in security and functionality, while WooCommerce (0.567) is highly flexible and Shopify (0.563) stable though less customizable. PrestaShop (0.505) and OpenCart (0.496) scored lower, making them suitable for smaller businesses. The contribution of this study lies in the integration of AHP-derived weights into the NWA framework under a dual expert panel structure, ensuring methodological independence and reducing bias. This hybrid approach offers both practical implications for digital business strategy and theoretical insights into combining hierarchical and network-based MCDM methods, thereby addressing a research gap in e-commerce software evaluation.

Keywords: e-commerce, multi-criteria decision-making, AHP, NWA, software platforms, Magento, WooCommerce, Shopify.

JEL Classification: M41, C83, L20.

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1. Introduction

In today's business environment, digitalization and technological development have significantly transformed how companies operate, communicate with clients, and deliver products and services (Ritter & Pedersen, 2020). E-commerce, as one of the key segments of the digital economy, has become an essential part of business strategies, enabling companies to reach global markets, provide 24/7 product availability and deliver personalized user interactions (Rosário & Raimundo, 2021). Its popularity and economic importance continue to grow thanks to advantages such as sales process automation, business flexibility and customized user experiences. However, despite its many benefits, selecting and implementing the ap-

propriate e-commerce software solution remains a complex challenge for organizations of all sizes (Tarafdar & Vaidya, 2006).

Various e-commerce platforms offer specific functionalities tailored to different user needs, but their effectiveness depends on alignment with business goals, integration with existing systems and long-term scalability (Ajiga et al., 2024). The selection process is far from trivial, as it requires the consideration of multiple factors, including functionality, security, compatibility with payment systems, SEO optimization, customer support and maintenance costs. A poor choice may lead to operational limitations, increased expenses and reduced customer satisfaction, all of which can negatively affect a company's performance and competitiveness (Abdallah et al., 2016).

Due to the complexity of this process, it is essential to apply a systematic and methodologically grounded approach to the evaluation of e-commerce platforms (Abdallah et al., 2016). Multi-Criteria Decision-Making (MCDM) offers an effective framework for making decisions in situations where multiple alternatives need to be compared based on various criteria (Taherdoost & Madanchian, 2023). Methods such as the Analytic Hierarchy Process (AHP) and Net Worth Analysis (NWA) enable quantitative and structured analysis of software solutions, with AHP providing a hierarchical decision structure (Munier & Hontoria, 2021) and NWA allowing for the analysis of interdependencies among criteria. By integrating these methods into a hybrid model, it is possible to achieve a more precise and reliable evaluation of software solutions, thereby minimizing the risk of suboptimal decisions (Bonissone et al., 2009).

Beyond technical aspects, e-commerce is not only a technological but also a strategic business challenge (Ehikioya & Guillemot, 2020). The need to optimize business processes, adapt to digital trends and enhance the customer experience calls for a holistic approach that includes not only an analysis of software features but also an evaluation of market trends, regulatory requirements and consumer expectations. Mobile commerce (m-commerce), digital marketing, AI-driven personalization and blockchain security protocols are just some of the trends shaping the future of e-commerce and must be considered when selecting a platform (Saket et al., 2024).

The development of a hybrid model that integrates AHP and NWA aims not only to facilitate the decision-making process but also to provide practical insights to help businesses optimize their digital sales strategies (Sanbella et al., 2024). This paper will thoroughly analyze key criteria for evaluating software solutions, including functionality, scalability, security, payment system integration, SEO optimization, maintenance costs and customer support. The ultimate goal of this research is to create a reliable and applicable decision-making model that enables companies to make informed, objective and optimal decisions when selecting an e-commerce software solution (Li et al., 2024). In addition to its practical application, this study also contributes to the development of multi-criteria decision-making theory, demonstrating how different methods can be integrated into an analytical tool for supporting business decisions. In this way, the research delivers significant value to both academic and business communities, contributing to the improvement of digital business practices and the application of advanced methodologies in the e-commerce sector.

The remainder of this paper is structured as follows. Section 2 provides an overview of e-commerce platforms, outlining their key functionalities, technologies and challenges related to software selection. Section 3 reviews the application of MCDM methods, with particular emphasis on the AHP and NWA models and their relevance in software evaluation. Section 4 describes the research methodology, detailing the hybrid AHP-NWA framework, selection of evaluation criteria, expert data collection process and analytical procedures. Section 5

presents the empirical results, including the AHP weight analysis, NWA-based ranking of e-commerce platforms and consistency checks. Section 6 discusses the key findings, theoretical insights, practical implications and limitations, while Section 7 concludes the paper by summarizing the main contributions and outlining directions for future research.

2. The use of software platforms in e-commerce

In recent decades, e-commerce has become a central part of the global economy, enabling companies to expand their business beyond physical boundaries and offer customers a convenient, fast and personalized shopping experience (Bilgihan et al., 2016). The development of e-commerce platforms plays a crucial role in this process, as it allows for the automation of sales operations, optimization of user experience and increased business efficiency (Aitazaz, 2023). Without appropriate software solutions, companies face challenges such as inefficient order processing, poor integration with payment systems, security risks, inadequate real-time inventory tracking, difficult customer communication and reduced capacity for data-driven strategic decision-making (Owusu-Berko, 2025).

Therefore, choosing the right e-commerce platform is of vital importance to the success of any digital business model (Rohn et al., 2021; Lee, 2001). Beyond technical features, the selection of e-commerce software also influences strategic business decisions, such as the monetization model, the level of user experience personalization, and methods of data processing (Sheth et al., 2025). Modern trends including the rise of mobile commerce, the use of artificial intelligence for data analysis and logistics optimization further complicate the platform selection process (Lu, 2019). Thus, a systematic approach to evaluating software solutions is essential to minimize risks and ensure long-term business sustainability.

This section explores the core features of e-commerce platforms, key technologies shaping the industry and the importance of making optimal decisions during the software selection process.

2.1. Specific characteristics of e-commerce platforms

E-commerce platforms serve as the backbone of digital business operations, allowing companies to efficiently manage all aspects of sales and customer interaction. (Lakshmi et al., 2020). Their functionality covers a wide range of processes, including:

- Product Management – Enables the creation, editing, categorization and inventory control of products.
- Order and Payment Processing – Integration with various payment systems allows for secure and fast transactions.
- Customer Support – Tools such as chatbots, support centers and automated communication enhance the user experience.
- User Experience Personalization – Recommendation algorithms and data analytics allow for tailored content delivery based on user preferences.

One of the key requirements for modern e-commerce platforms is scalability, i.e., the ability to support business growth without performance degradation (Ehikioya & Guillemot, 2020). As e-commerce becomes increasingly competitive, companies must ensure that their software solutions are flexible and adaptable to market changes (Chillapalli, 2022).

In addition to scalability, security and integration with external services play critical roles. Transaction security, customer data protection and compliance with regulatory standards

such as PCI-DSS and GDPR are decisive factors when selecting software (Wang et al., 2024). Furthermore, modern e-commerce solutions must enable seamless integration with payment systems, CRM tools, analytics platforms and external marketing services (Karim et al., 2024).

Considering these factors, the selection of e-commerce software is not merely a technical challenge, but also a strategic decision that impacts the long-term business goals of a company.

2.2. Technologies used in e-commerce solutions

Technological advancements have significantly enhanced the e-commerce sector, enabling companies to improve operational efficiency, personalize user experiences and increase transaction security (Bediako, 2023). Some of the most important technologies shaping modern e-commerce solutions include cloud computing, artificial intelligence, security and fraud detection technologies, SEO optimization and digital marketing.

Cloud Computing enables companies to access IT resources quickly and flexibly without the need for large infrastructure investments, significantly increasing scalability and operational efficiency (Karamchand, 2024). Leading providers such as Amazon Web Services (AWS), Google Cloud, and Microsoft Azure offer high availability, security and reliability key requirements for the successful operation of e-commerce systems. Using models like Software-as-a-Service (SaaS), companies can access software solutions via the internet without local hosting, simplifying maintenance, reducing costs and allowing businesses to focus on core activities.

Artificial Intelligence (AI) and Machine Learning (ML) play a crucial role in modern e-commerce by enabling personalized user experiences through data analysis and real-time content adaptation (Rane et al., 2024). E-commerce platforms use AI for product recommendations, interface personalization and targeted promotions, enhancing user engagement and satisfaction. AI-based chatbots and support systems facilitate effective communication and gather customer feedback, contributing to continuous service improvement. Additionally, ML supports demand forecasting, price optimization and fraud detection, thereby increasing security and operational effectiveness.

Security Technologies and Fraud Detection Systems are essential components of modern e-commerce platforms (Khurana, 2020). SSL/TLS encryption ensures secure data transmission between users and servers, protecting sensitive information and increasing customer trust in transaction safety (Hazra et al., 2024). Moreover, advanced AI fraud detection algorithms recognize suspicious behavior patterns and enable timely responses to potential abuse. The introduction of blockchain technology further enhances security and transparency by validating transactions without intermediaries, reducing operational costs and risks of manipulation.

SEO Optimization and Digital Marketing play a vital role in the success of e-commerce platforms by improving visibility, user engagement and conversion rates (Purnomo, 2023). Automated content optimization tools adjust keywords, metadata and page structures to meet search engine requirements, increasing organic traffic without the need for major investments. The use of Big Data analytics allows companies to deeply analyze user behavior, personalize marketing campaigns and offers, and make strategic decisions based on real data (Erevelles et al., 2016). Additionally, integration with social media platforms such as Facebook and Instagram enables direct sales and stronger user interaction (Fraccastoro et al., 2021) contributing to brand development and increased sales performance.

The integration of these technologies into e-commerce solutions helps companies boost conversion rates, enhance user experience and ensure data security (Saleem et al., 2019).

2.3. The importance of optimizing e-commerce software selection

The choice of e-commerce software directly affects business efficiency, revenue growth and customer satisfaction (Baršauskas et al., 2008). Making an inadequate decision can lead to numerous issues, including:

- Increased operational costs – platforms with high maintenance expenses can reduce profitability.
- Security risks – poorly protected systems may be vulnerable to cyberattacks and data breaches.
- Poor user experience – lack of customized functionalities can decrease conversion rates and lead to customer loss.

Therefore, a structured and methodologically grounded approach is essential for making an optimal decision. By using MCDM methods, it is possible to analyze available options through quantitative and objective criteria, thereby minimizing subjective factor during the selection process (Aruldoss et al., 2013).

The following sections will present in detail the hybrid decision-making model based on AHP and NWA methods, as well as the criteria that will enable a systematic evaluation of e-commerce platforms. This approach provides both practical application and academic contribution, offering companies concrete guidelines for optimizing operations in the digital environment.

2.4. Research contributions

This research makes the following contributions:

- It develops a hybrid AHP-NWA decision-making model adapted to the evaluation of e-commerce platforms.
- It introduces a dual expert panel structure that minimizes cognitive bias by separating the weighting of criteria from the evaluation of alternatives.
- It provides a systematic comparison and ranking of five widely used e-commerce platforms, offering practical insights for businesses.
- It contributes to MCDM theory by demonstrating how hierarchical and network-based methods can be combined into a coherent analytical tool applicable to software selection problems.

3. Review of MCDM applications

The development of e-commerce platforms and the need to make optimal decisions regarding the selection of appropriate software solutions (platforms) have stimulated numerous studies in the field of MCDM (Lu et al., 2023). Selecting the right e-commerce software requires the consideration of a large number of factors. To enable objective analysis, researchers have developed numerous decision-making methods that support quantitative evaluation of alternatives and informed decision-making (Aruldoss et al., 2013).

3.1. Overview of decision-making theories in the context of e-commerce

Decision-making theories provide the foundation for analytically and systematically solving selection problems in complex environments (Gregory et al., 2012), including the evaluation of software solutions for e-commerce. MCDM encompasses methods that allow for the as-

sessment of multiple alternatives based on different criteria, with the assignment of appropriate weighting coefficients (Ayan et al., 2023).

The most commonly used MCDM methods in the field of e-commerce include:

- Analytic Hierarchy Process (AHP) – a structured method that enables hierarchical comparison of criteria through pairwise assessments.
- Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) – ranks alternatives based on their distance from the ideal and worst-case solutions.
- Decision-Making Trial and Evaluation Laboratory (DEMATEL) – used to analyze interdependencies between criteria, providing better insight into how different factors influence the final decision.
- Best-Worst Method (BWM) – utilizes fewer pairwise comparisons than AHP, allowing for quicker and more efficient analysis of criteria.

In the context of e-commerce, these methods are applied to evaluate platforms according to parameters such as transaction security, customization flexibility, system reliability and cost efficiency. A key challenge in applying these methods is the appropriate weighting of criteria and consideration of interdependencies between factors, which traditional methods often fail to adequately address.

3.2. Application of AHP and NWA models in software evaluation

AHP is one of the most popular MCDM methods, particularly in the evaluation of technological solutions. This method enables:

- The structured breakdown of a problem into a hierarchical system of criteria and alternatives.
- Pairwise comparison of criteria, where each criterion is assigned a relative weight.
- Consistency checking of decisions through the calculation of the Consistency Index (CI) and Consistency Ratio (CR).

Combining the AHP method with the Net Worth Analysis (NWA) method enables the inclusion of insights from a second expert group, consisting of 10 specialists from the software industry and electronic business. This contributes to more objective results based on practical experience with relevant software. The first expert group, composed of three independent experts, defines the criteria and their interrelationships through consensus. Their work forms the foundation for decision-making, while each group contributes according to its expertise, integrating the model into a coherent whole.

By combining these scientific methods, it is possible to significantly improve the accuracy of decision-making in the selection of e-commerce platforms. This integration enables a more realistic assessment of software solutions and facilitates collaboration between two expert groups, who in practice often struggle to reach joint objective decisions.

3.3. Research gap

Although various MCDM methods such as: AHP, TOPSIS, DEMATEL and BWM have been applied to e-commerce evaluation, prior studies often rely on a single methodology and fail to address interdependencies among criteria. Moreover, most works focus on technical or cost-based evaluation without considering structured integration of multiple expert perspectives. There is limited research combining hierarchical weighting with network-based aggregation in the context of widely adopted e-commerce platforms. This study addresses this gap by

applying a hybrid AHP-NWA model, supported by dual expert groups, to provide both methodological rigor and practical applicability in the digital economy.

4. Methodology and materials

The evaluation of e-commerce software solutions requires a systematic approach that enables an objective and accurate assessment of various platforms. Given the complexity of this issue, this study applies a hybrid decision-making model that combines AHP and NWA. This combination allows for a detailed and comprehensive analysis of e-commerce platforms.

4.1. Simplified method for assessing the relative importance of criteria (AHP-NWA hybrid model)

It is important to note that the analysis relies exclusively on publicly available information and expert evaluations of the selected platforms. No proprietary data or permissions from software vendors were required, as all platforms are publicly accessible and widely documented in practice. The AHP-NWA hybrid model consists of seven main steps that provide a quantitative assessment of criteria and the ranking of alternatives.

4.1.1. Analytic hierarchy process (AHP) method

The Analytic Hierarchy Process (AHP) is a structured decision-making method that helps determine the relative importance of criteria and evaluate alternatives (Albayrak & Erensal, 2004). AHP enables pairwise comparison of both criteria and alternatives, with a consistency check to ensure the reliability of the results (Martinez et al., 2014). This method is particularly effective for solving complex decision-making problems involving multiple criteria and is widely used across various fields.

Step 1. Defining the Problem and Forming the Hierarchical Structure

The decision-making problem is decomposed into a hierarchy consisting of:

Goal: The overall objective of the decision-making process.

Criteria: Key factors influencing the decision, denoted as C_1, C_2, ..., C_n.

Alternatives: The possible options being evaluated.

Step 2. Pairwise Comparison of Criteria

The relative importance of the criteria is assessed through pairwise comparisons. Decision-makers assign numerical values to express the importance of one criterion over another, using Saaty's scale (values from 1 to 9, where 1 indicates equal importance and 9 indicates extreme importance) (Beynon, 2002). The pairwise comparison matrix A is constructed as follows:

$$A = \begin{bmatrix} 1 & a_{12} & a_{13} & \cdots a_{1n} \\ \frac{1}{a_{12}} & 1 & a_{23} & \cdots a_{2n} \\ \frac{1}{a_{13}} & \frac{1}{a_{23}} & 1 & \cdots a_{3n} \\ \vdots & \vdots & \vdots & \ddots \vdots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \frac{1}{a_{3n}} & \cdots 1 \end{bmatrix}. \quad (1)$$

Step 3. Normalization of the Pairwise Comparison Matrix

Each element of the pairwise comparison matrix A is divided by the sum of its respective column to obtain the normalized matrix A_{norm}:

$$A_{norm} = \begin{bmatrix} \frac{a_{11}}{\sum_{i=1}^{n} a_{i1}} & \frac{a_{12}}{\sum_{i=1}^{n} a_{i2}} & \cdots & \frac{a_{1n}}{\sum_{i=1}^{n} a_{in}} \\ \frac{a_{21}}{\sum_{i=1}^{n} a_{i1}} & \frac{a_{22}}{\sum_{i=1}^{n} a_{i2}} & \cdots & \frac{a_{2n}}{\sum_{i=1}^{n} a_{in}} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{a_{n1}}{\sum_{i=1}^{n} a_{i1}} & \frac{a_{n2}}{\sum_{i=1}^{n} a_{i2}} & \cdots & \frac{a_{nn}}{\sum_{i=1}^{n} a_{in}} \end{bmatrix}. \quad (2)$$

Step 4. Calculation of Priority Weights

The relative weight w_i of each criterion is obtained by computing the average value of each row in the normalized matrix:

$$w_i = \frac{\sum_{j=1}^{n} A_{norm,ij}}{n}, \; i = 1, 2, \ldots, n. \quad (3)$$

Step 5. Consistency Check

Calculation of the consistency vector W:

$$W = Aw. \quad (4)$$

Multiply the original comparison matrix by the weight vector.

Calculation of the Consistency Index (CI):

$$CI = \frac{\lambda_{max} - n}{n-1}; \quad (5)$$

$$\lambda_{max} = \frac{\sum_{i=1}^{n} \left(W_i / w_i \right)}{n}, \quad (6)$$

where λ_{max} is the principal eigenvalue and n is the number of criteria.

Calculation of the Consistency Ratio (CR):

$$CR = \frac{CI}{RI}, \quad (7)$$

where, RI is the Random Index based on the size of the matrix n. A CR value below 0.1 is considered acceptable.

Step 6. Evaluation of Alternatives

The alternatives are evaluated using the same pairwise comparison and weight calculation procedure within each criterion. The final ranking is determined by aggregating the weighted scores of the alternatives. This systematic approach ensures that the decision-making process is rational and consistent, enabling the selection of optimal solutions.

4.1.2. NWA (Net Worth Analysis)

NWA is a multi-criteria decision-making approach based on analyzing the network relationships among decision elements (Marinović et al., 2025.). Unlike traditional hierarchical methods such as AHP, which assume a linear structure of criteria, NWA allows modeling of interdependencies and feedback loops that may occur in complex systems. In this way, NWA introduces a higher level of realism in situations where criteria are not independent, but instead interwoven and mutually reinforcing.

Step 7. Final Evaluation of Software

The final values, taking into account the significance factors, are calculated according to the following equation:

$$N = \sum_{j=1}^{9} g_j \, n_{ij}. \tag{8}$$

4.2. Criteria for evaluating e-commerce software solutions

The evaluation of e-commerce platforms in this study is based on seven key criteria, which are presented in Table 1 together with their use in previous research.

Table 1. Criteria for evaluating e-commerce platforms and supporting literature

Criterion	Supporting Literature (Internet)
Functionality	Mahmudova and Jabrailova (2020)
Cost and Maintenance	Ernst & Young (2021), IronPlane (2023)
Security and Data Protection	Jayathilaka and Udara (2024)
Scalability and Flexibility	Zbąski (2024)
Integration and Compatibility	Miller (2025)
Performance Optimization	Daniele (2025)
User Experience and Support	Lichon (2023)

1. Functionality (F) – refers to the scope and quality of features that enable the management of sales processes. Key elements include product management, order processing, support for multiple currencies and languages and flexibility in customizing the user interface. The platform should enable automation of business processes, thereby increasing efficiency and reducing operational costs. Integration with various payment methods and data analysis tools further enhances its usability. A high level of functionality improves competitive advantage, allowing businesses to better respond to market demands.
2. Cost and Maintenance (T) – includes initial investments, monthly fees, upgrades, and additional technical support expenses. Open-source solutions often have lower upfront costs but require greater investment in customization and security updates. SaaS (Software-as-a-Service) platforms offer easier implementation but may have hidden costs such as transaction fees and paid modules. Long-term costs include server maintenance, technical support and security updates, which can significantly impact profitability. An optimal solution should balance service quality and cost, enabling stable business growth.

3. Security and Data Protection (G) – is critical for safeguarding user data, preventing cyberattacks and ensuring secure transactions. The platform should support SSL/TLS encryption, PCI-DSS compliance, multi-factor authentication, and protection against DDoS attacks. The growing threat of cyber risks requires regular software updates and the implementation of AI-driven fraud detection systems. GDPR and other regulatory frameworks impose strict requirements for data management and storage, meaning platforms must have clearly defined security policies. A reliable security infrastructure increases customer trust and reduces the risk of financial loss.
4. Scalability and Flexibility (S) – refers to the platform's ability to adapt to business growth and market changes. It must support an increasing number of products, users and transactions without performance degradation. Flexibility includes the ability to customize design, extend functionality and integrate with additional services. SaaS solutions offer easier scalability via cloud infrastructure, while standalone solutions require manual server adjustments and database optimization. Good scalability enables long-term growth without frequent platform changes.
5. Integration and Compatibility (I) – platforms must be compatible with various tools and services, including inventory management systems, analytics, CRM and payment processors. Effective integration allows for process automation, reduces errors and improves user experience. API compatibility enables easy connection with external applications, while modular platform design simplifies the addition of new features. Integration is especially important for large enterprises using multiple interconnected systems, but also for small businesses aiming to optimize operations without major technical interventions. Efficient integration streamlines operations, enhances data analysis and improves operational performance.
6. Performance Optimization (O) – refers to page load speed, system stability and platform efficiency under load. Slow platforms negatively impact conversions and SEO ranking, as users expect load times under three seconds. Optimization includes caching, reducing HTTP requests, database optimization and image compression. Cloud hosting solutions provide better performance scalability, while self-hosted platforms require ongoing infrastructure monitoring and optimization. Strong performance optimization improves user experience and increases conversion rates.
7. User Experience (UX) and Support (K) – are key factors for customer retention and sales growth. Intuitive design, easy navigation and mobile responsiveness enhance user engagement and reduce bounce rates. In addition to the interface, good customer support, such as live chat, phone assistance and knowledge base FAQs increases user satisfaction. Automated options like chatbots and AI-powered support can reduce wait times and improve communication. An e-commerce platform with tailored UX solutions and efficient support ensures more repeat purchases and customer loyalty.

By applying the AHP-NWA methodology, each of these criteria is quantitatively evaluated, enabling a systematic and precise assessment of various software solutions. This approach ensures a comprehensive ranking of e-commerce platforms, allowing businesses to make informed decisions when selecting the optimal software for their needs.

4.3. Expert evaluation and data collection

Two independent expert panels were involved in the evaluation process. The first group consisted of three academic experts specializing in information systems and e-commerce (5–10

years of research experience), who were responsible for defining the criteria and conducting pairwise comparisons in the AHP stage. The second group comprised ten industry practitioners, including e-commerce managers, IT consultants and software developers with 7–15 years of professional experience. This group evaluated the software platforms according to the defined criteria using the NWA method. Data were collected through structured questionnaires, distributed electronically and consolidated through consensus discussions. This dual-panel approach ensured methodological independence, reduced cognitive bias and enhanced the robustness of the results.

4.4. Analyzed e-commerce software solutions

This study analyzes five of the most popular e-commerce platforms widely used in digital business. Each of these platforms has specific strengths and weaknesses, evaluated based on the key criteria used in this research:

- Magento – One of the most powerful e-commerce platforms, known for its high level of customization and scalability. It is suitable for medium and large enterprises that require advanced functionalities, security and flexibility. However, it demands significant technical resources for implementation and maintenance.
- WooCommerce – A popular plugin for WordPress that allows easy integration with existing websites. Ideal for small and medium-sized businesses due to its flexibility, though it may face limitations in scalability and performance for large-scale e-commerce sites.
- Shopify – A SaaS (Software-as-a-Service) platform that enables quick and easy e-commerce deployment. It offers a stable and secure environment with a wide range of plugins but may be limited in customization and can incur additional costs through transaction fees.
- PrestaShop – An open-source platform with good flexibility and a wide selection of modules. It is suitable for medium-sized entrepreneurs seeking a customizable solution with lower costs, though it may require additional technical resources for optimization and maintenance.
- OpenCart – A lightweight and easy-to-use e-commerce system that allows for rapid implementation. It is an ideal solution for small businesses but lacks the advanced features found in platforms like Magento and WooCommerce.

Each of these platforms has been evaluated according to the AHP-NWA model criteria, enabling an objective ranking and identification of the most optimal solution for various user needs.

5. Research results

In this study, the AHP analysis was applied to assign weight factors to each criterion. A consistency check was then conducted to ensure that the assigned values were logically consistent. Finally, the NWA method was applied to further enhance the accuracy of evaluating the alternatives.

The following tables present the results of the analyses, including the AHP matrix with normalized values, consistency checks and the final ranking of e-commerce platforms based on the obtained weight factors. These analyses clearly highlight the key strengths and weaknesses of various software solutions, thereby facilitating the decision-making process in a business context.

5.1. AHP matrix (pairwise comparison + normalized values)

The results of the AHP analysis, shown in Table 2, clearly indicate the relative importance of different criteria in the decision-making process for selecting an e-commerce software platform. Security and data protection (32%) and functionality (25%) are dominant, suggesting that scalability, adaptability and platform security are critical factors in the selection process. This finding is especially important for companies planning long-term growth and business expansion, as system stability under heavy load proves to be essential.

Functionality (F) is the second most important criterion, accounting for 25% of the total weight, confirming that the number and type of available features are key to the platform's operational efficiency. Systems that support advanced automation of business processes, easy inventory management and flexibility in order processing have a clear advantage. On the other hand, cost and maintenance (T) account for 14% of the importance, highlighting the balance between quality and cost-effectiveness. While costs play a significant role, companies are willing to invest in more reliable and scalable solutions if they bring long-term value.

Security and data protection (G), with 32% importance, confirms that transaction and customer data protection play an almost decisive role. Integration with external systems (I) and performance optimization (O) carry lower weights (5% and 8%, respectively), indicating that while important, these issues are often solvable through customized modules. User experience and support (K) ranks last with only 4% importance, suggesting that while UX is relevant, it is not a primary factor in the initial phase of platform selection.

Table 2. AHP analysis (pairwise comparison + normalized values) (source: author's research)

	F	T	S	G	I	O	K	Weighting Factor (%)
F	1	3	2	1/2	5	5	5	25%
	0.226	0.308	0.270	0.181	0.267	0.269	0.200	
T	1/3	1	1/2	1/3	4	4	4	14%
	0.075	0.103	0.067	0.120	0.213	0.215	0.160	
S	1/2	2	1	1/3	1/4	3	4	11%
	0.113	0.205	0.135	0.120	0.013	0.161	0.006	
G	2	3	3	1	5	5	5	32%
	0.451	0.308	0.404	0.361	0.267	0.269	0.200	
I	1/5	1/4	1/3	1/5	1	1/3	2	5%
	0.045	0.026	0.045	0.072	0.053	0.018	0.080	
O	1/5	1/4	1/3	1/5	3	1	4	8%
	0.045	0.026	0.045	0.072	0.160	0.054	0.160	
K	1/5	1/4	1/4	1/5	1/2	1/4	1	4%
	0.045	0.026	0.034	0.072	0.027	0.013	0.040	
Σ	4.433	9.750	7.417	2.767	18.750	18.583	25.000	100%
	1.000	1.000	1.000	1.000	1.000	1.000	1.000	

These results indicate that in business environments, the most valued aspects when selecting software solutions are security, flexibility and operational capabilities of the platform, while costs and integration are considered secondary. This systematic approach enables more precise and objective decision-making, aligning technical requirements with the strategic goals of the enterprise.

5.2. Consistency check of the AHP matrix

The results of the AHP matrix consistency check, presented in Table 3, show that the final Consistency Ratio (CR) was 0.06, which is below the threshold of 0.10, indicating only minimal inconsistency in the comparison of criteria. According to established consistency standards, the ideal case would be CR = 0.00, which would signify complete consistency in the evaluations. However, given the subjectivity inherent in human decision-making, some deviations are expected and acceptable. Since the obtained result is well below the limit of 0.20, we can conclude that the pairwise comparisons are sufficiently consistent and valid for decision-making, and there is no need for reevaluation. If the CR had fallen between 0.20 and 0.80, it would be advisable to reconsider the assessments, while values above 0.80 would indicate random judgments and data unreliability. Given that the result lies within acceptable boundaries, we conclude that the calculated criterion weights can be reliably used in further analysis and the overall decision-making process.

Table 3. AHP matrix consistency check (source: author's research)

	F	T	S	G	I	O	K	Matrix	CI	Lambda Max	
F	1	3	2	1/2	5	5	5	1.86	7.57	1.08	
	0.246	0.409	0.216	0.161	0.242	0.401	0.183				
T	1/3	1	1/2	1/3	4	4	4	1.04	7.64	1.09	
	0.082	0.136	0.054	0.108	0.194	0.321	0.147				
S	1/2	2	1	1/3	1/4	3	4	1.01	9.38	1.34	
	0.123	0.273	0.108	0.108	0.012	0.241	0.147				
G	2	3	3	1	5	5	5	2.37	7.35	1.05	
	0.491	0.409	0.323	0.323	0.242	0.401	0.183				
I	1/5	1/4	1/3	1/5	1	1/3	2	0.33	6.86	0.98	
	0.049	0.034	0.036	0.065	0.048	0.027	0.073				
O	1/5	1/4	1/3	1/5	3	1	4	0.52	6.53	0.93	
	0.049	0.034	0.004	0.065	0.145	0.080	0.147				
K	1/5	1/4	1/4	1/5	1/2	1/4	1	0.26	6.97	1.00	
	0.049	0.034	0.027	0.065	0.024	0.020	0.037				
Σ									52.29	7.47	0.06

5.3. Final calculation results using the NWA method

The final calculation results using the NWA method, shown in Table 3, incorporate the influence factors obtained through the AHP method and enable the determination of the final

ranking of e-commerce software platforms. Based on the total score, Magento ranked first, while OpenCart was assessed as the least competitive platform.

Magento achieved the highest overall score (0.575) and leads in the categories of functionality (1.130 points) and security (0.496 points), making it the most reliable choice for advanced and scalable e-commerce systems. Although it received slightly lower ratings in performance optimization, this did not significantly affect its overall advantage.

WooCommerce took second place with a total score of 0.567, emerging as the top platform in the scalability and flexibility criterion (1.421 points). However, it scored somewhat lower in security, which may be a concern for businesses that require high levels of transaction protection.

Shopify was ranked third with a score of 0.563, showing solid performance in functionality and security, but lower results in integration and scalability.

PrestaShop ranked fourth with a score of 0.505, demonstrating moderate performance across all categories, but not excelling in any of the key areas. This makes it suitable for smaller businesses with lower technical requirements.

OpenCart received the lowest score (0.496), with its main weaknesses identified in scalability and security, making it less suitable for businesses with high transaction volumes.

5.4. Final results

Based on the AHP-NWA model, Magento has proven to be the best choice for e-commerce systems requiring high functionality, security and flexibility, while WooCommerce and Shopify also represent solid options depending on specific user needs. PrestaShop and OpenCart offer certain advantages but receive lower scores in key criteria, making them less competitive overall. These results confirm in Table 4. that structured decision-making models such as AHP-NWA enable more accurate assessment of software solutions, minimize subjective bias and support informed business decisions.

Table 4. final calculation results using the NWA method (source: author's research)

Criteria	Weight (%)	Shopify		WooCommerce		Magento		PrestaShop		OpenCart	
		experts	points	experts	points	experts	points	experts	points	experts	points
F	25%	4.3	1.056	3.9	0.958	4.6	1.130	3.4	0.835	4.0	0.982
T	14%	3.3	0.450	3.6	0.491	3.2	0.436	3.3	0.450	3.4	0.463
S	11%	4.3	0.463	3.8	0.410	4.6	0.496	3.3	0.356	3.4	0.366
G	32%	4.2	1.356	4.4	1.421	4.3	1.389	3.8	1.227	3.3	1.066
I	5%	3.7	0.179	4.3	0.208	3.7	0.179	4.0	0.194	3.8	0.184
O	8%	3.8	0.305	4.3	0.345	3.4	0.273	4.2	0.337	3.4	0.273
K	4%	3.5	0.128	3.8	0.139	3.4	0.125	3.8	0.139	3.8	0.139
Sum	100%	3.87	0.563	4.01	0.567	3.89	0.575	3.69	0.505	3.59	0.496
Score		3		2		1		4		5	

6. Discussion

The AHP method analysis revealed that security (32%) and functionality (25%) are the most important criteria when selecting a software solution, while scalability (11%) and maintenance

costs (14%) are also considered significant factors. These results indicate that companies seek long-term solutions that support growth and adaptability, while cost aspects are regarded as more important than user experience (4%). The application of the NWA method further enhanced the precision of the decision by incorporating expert opinions and delivering final results and a ranking of software solutions according to the defined criteria. Naturally, the outcomes of this model may vary depending on how each decision-maker assigns weight to the criteria.

The final results show that Magento achieved the highest score (0.575), positioning it as the best platform for advanced e-commerce systems. WooCommerce ranked second (0.567) due to its high flexibility and scalability, while Shopify took third place (0.563) with strong functionality performance but some limitations in customization. PrestaShop and OpenCart received the lowest scores, suggesting they are not optimal choices for businesses with complex operational needs.

These findings support the claim that structured decision-making methods can be effectively applied to analyze e-commerce platforms, reducing subjective factors and enabling informed business decisions. An additional advantage of the AHP-NWA model is its applicability to other areas of digital business. The methodology used in this study can be applied to the selection of cloud solutions, ERP systems and other software platforms that require quantitative evaluation.

Based on the results, it can be concluded that the application of MCDM methods is essential in modern digital business, as it enables a detailed analysis of the factors influencing the success of e-commerce systems. This study provides practical guidelines for companies aiming to optimize their software selection process, as well as an academic contribution to the field of MCDM.

Future research should include a greater number of software solutions and examine additional factors such as the reliability of technical support and long-term cost-effectiveness in order to develop even more accurate evaluation models.

6.1. Theoretical insights

From a theoretical perspective, this research demonstrates the value of integrating hierarchical (AHP) and network-based (NWA) methods within the broader framework of decision theory. While AHP provides a consistent mechanism for weighting criteria, NWA captures interdependencies and practical trade-offs across alternatives. The use of dual expert groups further strengthens the model by separating subjective weighting from applied evaluation, aligning with recent debates in MCDM theory on reducing bias and enhancing replicability. Thus, the study contributes to bridging methodological advances with practical applications in digital business environments.

6.2. Limitations and recommendations for future research

Although the results demonstrated the usefulness of the hybrid AHP-NWA model for evaluating e-commerce platforms, there are certain limitations of this study that should be considered when interpreting the results and planning future research.

The focus of this study was on five popular e-commerce software platforms (Shopify, WooCommerce, Magento, PrestaShop and OpenCart), while future research could include a broader range of software solutions.

The AHP method, although providing a clear structural framework for evaluation, relies on expert judgments, which may introduce a certain degree of subjectivity into the results. Future studies could incorporate machine learning and statistical methods to further reduce subjective influence and enhance the objectivity of evaluations.

This model did not directly take into account economic and market factors, such as changes in licensing costs, availability of technical support, long-term demand trends, and the impact of global digital transformation, all of which can also play a critical role in platform selection.

Given these limitations, recommendations for future research include the development of more advanced hybrid models that integrate AHP, NWA and AI-based methods to enable a more precise analysis of interdependencies between criteria and automated evaluation of alternatives. Empirical studies involving real-world business entities would be particularly valuable for validating the proposed model under real operating conditions, enabling direct application of the methodology within the e-commerce industry.

Additionally, incorporating dynamic market factors, such as changes in consumer preferences, regulatory requirements and technological innovations, would enable analysis of the long-term sustainability of software solutions and more accurate forecasting of future e-commerce trends.

These research directions could contribute to the development of more comprehensive and adaptable decision-making methods, helping companies improve their digital transformation strategies and optimize the software selection process.

In addition, future research may extend the proposed hybrid framework by integrating fuzzy logic, Delphi method or AI-based evaluation models to further reduce subjectivity and enhance predictive accuracy in software selection problems.

6.3. Practical application of results

The obtained results can be practically applied in the business sector, where companies can utilize the proposed AHP-NWA model to make informed decisions regarding the selection of e-commerce software. This model enables quantitative evaluation of different alternatives, thereby reducing subjectivity in the decision-making process and increasing the accuracy of software selection in line with specific business needs. Companies can use the model to optimize costs, improve operational efficiency and enhance digital business strategies.

The benefits of applying the AHP-NWA model include:

- More accurate analysis of costs and performance of various e-commerce platforms, enabling better budget control and long-term return on investment.
- Clearly defined criteria for selecting a software solution, ensuring that the chosen platform meets the business's functional, security and technical requirements.
- Minimization of the risk of selecting inadequate software, directly contributing to reduced operational costs and preventing later complications related to integration, scalability or system security.
- Support for strategic decision-making related to business digitalization, allowing companies to adapt to market trends and technological innovations.
- Improved competitive advantage, as it enables faster and more efficient evaluation of software options, thereby shortening the time required for implementing the optimal solution.

The application of MCDM methods such as AHP and NWA provides a systematic, objective and analytical approach to selecting e-commerce platforms. This reduces

subjectivity in the decision-making process and ensures that companies align software capabilities with their business goals. Such an approach not only contributes to process optimization, but also enables businesses to increase efficiency and long-term sustainability in the digital environment.

7. Conclusions

This study has demonstrated that selecting an e-commerce platform is a complex process that requires a systematic and quantitative decision-making approach. The application of the hybrid AHP-NWA model enabled the objective ranking of software solutions based on a multi-criteria analysis, identifying Magento, WooCommerce and Shopify as the best choices for digital commerce operations. Magento stood out as the most optimal platform due to its high functionality, security and scalability, while WooCommerce proved to be the best in terms of flexibility and ease of integration with WordPress. Shopify demonstrated excellent stability and ease of use, though with certain limitations in terms of customization and cost.

The use of the AHP method allowed for precise weighting of the criteria, with security (32%) and functionality (25%) recognized as the most important decision factors. On the other hand, scalability (11%) and maintenance costs (14%) had a notable influence but were not dominant compared to the platform's growth and adaptability capabilities. The consistency check results showed a final consistency ratio of 0.06, confirming the reliability of the obtained outcomes.

The research findings confirm that MCDM models can be successfully applied in the analysis of e-commerce software solutions, enabling companies to make informed and optimal decisions based on quantitative analyses. This approach not only improves the decision-making process but also reduces the risks associated with choosing inadequate software solutions. This approach not only improves the decision-making process but also reduces the risks associated with choosing inadequate software solutions. The technical novelty lies in the integration of AHP-derived weights into the NWA framework under a dual expert panel structure, ensuring methodological independence and reducing bias, an approach not commonly applied in previous e-commerce evaluation studies.

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Author contributions

Conceptualization, R.R. and D.V.; methodology, R.R. and D.V.; software, N.G.; validation, D.S. and M.G.; formal analysis, R.R.; investigation, N.G.; writing – original draft preparation, R.R.; writing – review and editing, D.S. and M.G.; supervision, D.V. All authors have read and agreed to the published version of the manuscript.

References

Abdallah, A. B., Phan, A. C., & Matsui, Y. (2016). Investigating the effects of managerial and technological innovations on operational performance and customer satisfaction of manufacturing companies. *International Journal of Business Innovation and Research*, *10*(2–3), 153–183. https://doi.org/10.1504/IJBIR.2016.074824

Aitazaz, F. (2023). *Advanced AI/ML techniques for business intelligence in IoT-enabled manufacturing with ERP cloud integration*. https://www.researchgate.net/publication/388802376_Advanced_AIML_Techniques_for_Business_Intelligence_in_IoT-_Enabled_Manufacturing_with_ERP_Cloud_Integration

Ajiga, D., Okele, P. A., Folorunsho, S. A., & Ezeigweneme, O. (2024). Methodologies for developing scalable software frameworks that support growing business needs. *International Journal of Management and Entrepreneurship Research*, *6*, 2661–2683. https://doi.org/10.51594/ijmer.v6i8.1413

Albayrak, E., & Erensal, Y. C. (2004). Using analytic hierarchy process (AHP) to improve human performance: An application of multiple criteria decision making problem. *Journal of Intelligent Manufacturing*, *15*, 491–503. https://doi.org/10.1023/B:JIMS.0000034112.00652.4c

Aruldoss, M., Lakshmi, T. M., & Venkatesan, V. P. (2013). A survey on multi criteria decision making methods and its applications. *American Journal of Information Systems*, *1*(1), 31–43.

Ayan, B., Abacıoğlu, S., & Basilio, M. P. (2023). A comprehensive review of the novel weighting methods for multi-criteria decision-making. *Information*, *14*(5), Article 285. https://doi.org/10.3390/info14050285

Baršauskas, P., Šarapovas, T., & Cvilikas, A. (2008). The evaluation of e-commerce impact on business efficiency. *Baltic Journal of Management*, *3*(1), 71–91. https://doi.org/10.1108/17465260810844275

Bediako, G. (2023). *The application of Big Data Analytics in improving eCommerce processes. The Retail sector user experience* [BSc thesis, Häme University of Applied Sciences].

Beynon, M. (2002). An analysis of distributions of priority values from alternative comparison scales within AHP. *European Journal of Operational Research*, *140*(1), 104–117. https://doi.org/10.1016/S0377-2217(01)00221-1

Bilgihan, A., Kandampully, J., & Zhang, T. (2016). Towards a unified customer experience in online shopping environments: Antecedents and outcomes. *International Journal of Quality and Service Sciences*, *8*(1), 102–119. https://doi.org/10.1108/IJQSS-07-2015-0054

Bonissone, P. P., Subbu, R., & Lizzi, J. (2009). Multicriteria decision making (MCDM): A framework for research and applications. *IEEE Computational Intelligence Magazine*, *4*(3), 48–61. https://doi.org/10.1109/MCI.2009.933093

Chillapalli, N. T. R. (2022). Software as a service (SaaS) in e-commerce: The impact of cloud computing on business agility. *Journal of Engineering and Computer Sciences*, *1*(10), 7–18.

Daniele, C. (2025, March 19). *Performance requirements and 10 best practices for high-speed e-commerce websites*. Kinsta. https://kinsta.com/blog/ecommerce-performance/

Ehikioya, S. A., & Guillemot, E. (2020). A critical assessment of the design issues in e-commerce systems development. *Engineering Reports*, *2*(4), Article e12154. https://doi.org/10.1002/eng2.12155

Erevelles, S., Fukawa, N., & Swayne, L. (2016). Big Data consumer analytics and the transformation of marketing. *Journal of Business Research*, *69*(2), 897–904. https://doi.org/10.1016/j.jbusres.2015.07.001

Ernst & Young. (2021, March 18). *Three things to consider when evaluating your e-commerce platform*. EY. https://www.ey.com/en_gl/alliances/three-things-to-consider-when-evaluating-your-e-commerce-platform

Fraccastoro, S., Gabrielsson, M., & Pullins, E. B. (2021). The integrated use of social media, digital, and traditional communication tools in the B2B sales process of international SMEs. *International Business Review*, *30*(4), Article 101776. https://doi.org/10.1016/j.ibusrev.2020.101776

Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T., & Ohlson, D. (2012). *Structured decision making: A practical guide to environmental management choices*. John Wiley & Sons. https://doi.org/10.1002/9781444398557

Hazra, R., Chatterjee, P., Singh, Y., Podder, G., & Das, T. (2024). Data encryption and secure communication protocols. In P. K. Goel (Ed.), *Strategies for e-commerce data security: Cloud, blockchain, AI, and machine learning* (pp. 546–570). IGI Global. https://doi.org/10.4018/979-8-3693-6557-1.ch022

IronPlane. (2023, May 15). *Understanding the true cost of eCommerce platform support and maintenance*. IronPlane. https://www.ironplane.com/ironplane-ecommerce-blog/understanding-the-true-cost-of-ecommerce-platform-support-and-maintenance

Jayathilaka, R., & Udara, I. (2024). Security matters: Empowering e-commerce in Sri Lanka through customer insights. *Humanities and Social Sciences Communications*, *11*, Article 1054. https://doi.org/10.1057/s41599-024-03585-2

Karamchand, G. K. (2024). Scaling new heights: The role of cloud computing in business transformation. *International Journal of Digital Innovation*, *5*(1).

Karim, R. A., Rabiul, M. K., Tahrin, S., & Arfat, S. M. (2024). The nexus between CRM and behavioural loyalty in hotel sector: The mediating role of relationship quality (trust and satisfaction). *Global Knowledge, Memory and Communication*. https://doi.org/10.1108/GKMC-03-2024-0169

Khurana, R. (2020). Fraud detection in ecommerce payment systems: The role of predictive AI in real-time transaction security and risk management. *International Journal of Applied Machine Learning and Computational Intelligence*, *10*(6), 1–32.

Lakshmi, P., StalinDavid, D., Kalaria, H. I., Jayadatta, S., Sharma, A., & Saravanan, D. (2020). Research on collaborative innovation of E-commerce business model for commercial transactions. *Turkish Journal of Physiotherapy and Rehabilitation*, *32*(3), 787–794.

Lee, C.-S. (2001). An analytical framework for evaluating e-commerce business models and strategies. *Internet Research*, *11*(4), 349–359. https://doi.org/10.1108/10662240110402803

Li, C., Ke, J., & Cai, L. (2024). Application research of factor constraint algorithm in E-commerce logistics route optimization. *Decision Making*: *Applications in Management and Engineering*, *7*(1), 145–159. https://doi.org/10.31181/dmame712024932

Lichon, J. (2023, June 27). *14 key factors in selecting the best commerce software*. BlueBolt Solutions. https://www.blueboltsolutions.com/14-key-factors-in-selecting-the-best-commerce-software/

Lu, Y. (2019). Artificial intelligence: A survey on evolution, models, applications and future trends. *Journal of Management Analytics*, 6(1), 1–29. https://doi.org/10.1080/23270012.2019.1570365

Lu, Y.-H., Yeh, C.-C., & Liau, T.-W. (2023). Exploring the key factors affecting the usage intention for cross-border e-commerce platforms based on DEMATEL and EDAS method. *Electronic Commerce Research*, *23*(4), 2517–2539. https://doi.org/10.1007/s10660-022-09548-6

Marinović, M., Viduka, D., Lavrnić, I., Stojčetović, B., Skulić, A., Bašić, A., Balaban, P., & Rastovac, D. (2025). An intelligent multi-criteria decision approach for selecting the optimal operating system for educational environments. *Electronics*, *14*(3), Article 514. https://doi.org/10.3390/electronics14030514

Martinez, M., de Andrés, D., Ruiz, J.-C., & Friginal, J. (2014). From measures to conclusions using analytic hierarchy process in dependability benchmarking. *IEEE Transactions on Instrumentation and Measurement*, *63*(11), 2548–2556. https://doi.org/10.1109/TIM.2014.2348632

Mahmudova, S., & Jabrailova, Z. (2020). Development of an algorithm using the AHP method for selecting software according to its functionality. *Soft Computing*, *24*, 8495–8502. https://doi.org/10.1007/s00500-020-04902-y

Miller, T. (2025, June 13). *Top 10 ERP selection criteria* (*including checklist*). ERP Focus. https://www.erpfocus.com/ten-essential-erp-selection-criteria-2640.html

Munier, N., & Hontoria, E. (2021). The hierarchical structure. In *Uses and limitations of the AHP method*: *A non-mathematical and rational analysis* (pp. 5–13). Springer. https://doi.org/10.1007/978-3-030-60392-2_2

Owusu-Berko, L. (2025). Advanced supply chain analytics: Leveraging digital twins, IoT and blockchain for resilient, data-driven business operations. *World Journal of Advanced Research and Reviews*, *25*(2), 1777–1799. https://doi.org/10.30574/wjarr.2025.25.2.0572

Purnomo, Y. J. (2023). Digital marketing strategy to increase sales conversion on e-commerce platforms. *Journal of Contemporary Administration and Management* (*ADMAN*), *1*(2), 54–62. https://doi.org/10.61100/adman.v1i2.23

Rane, N., Choudhary, S., & Rane, J. (2024, May 27). *Artificial intelligence and machine learning in business intelligence, finance, and e-commerce*: *A review*. SSRN. https://doi.org/10.2139/ssrn.4843988

Ritter, T., & Pedersen, C. L. (2020). Digitization capability and the digitalization of business models in business-to-business firms: Past, present, and future. *Industrial Marketing Management*, *86*, 180–190. https://doi.org/10.1016/j.indmarman.2019.11.019

Rohn, D., Bican, P. M., Brem, A., Kraus, S., & Clauss, T. (2021). Digital platform-based business models – An exploration of critical success factors. *Journal of Engineering and Technology Management*, *60*, Article 101625. https://doi.org/10.1016/j.jengtecman.2021.101625

Rosário, A., & Raimundo, R. (2021). Consumer marketing strategy and E-commerce in the last decade: A literature review. *Journal of Theoretical and Applied Electronic Commerce Research*, *16*(7), 3003–3024. https://doi.org/10.3390/jtaer16070164

Saleem, H., Shaiq Uddin, M. K., Habib-ur-Rehman, S., Saleem, S., & Muhammad Aslam, A. (2019). Strategic data driven approach to improve conversion rates and sales performance of e-commerce websites. *International Journal of Scientific & Engineering Research*, *10*(4), 588–593.

Saket, S., Agarwal, M., & Mehrotra, R. (2024). *Crafting tomorrow: The influence of design choices on fresh content in social media recommendation*. arXiv:2410.15174.

Sanbella, L., Van Versie, I., & Audiah, S. (2024). Online marketing strategy optimization to increase sales and e-commerce development: An integrated approach in the digital age. *Startupreneur Business Digital* (*SABDA Journal*), *3*(1), 54–66. https://doi.org/10.33050/sabda.v3i1.492

Sheth, R., Parekha, C., Kumar, P., Kumar, A., & Patel, K. (2025). Transforming service sectors with IoT, ML, and comprehensive security solutions. In A. Kumar, P. Kumar, S. Rathee, & B. Kumar (Eds.), *Mechatronics: Concepts, tools, applications, and new trends*. CRC Press. https://doi.org/10.1201/9781003494478-3

Taherdoost, H., & Madanchian, M. (2023). Multi-criteria decision making (MCDM) methods and concepts. *Encyclopedia*, *3*(1), 77–87. https://doi.org/10.3390/encyclopedia3010006

Tarafdar, M., & Vaidya, S. D. (2006). Challenges in the adoption of E-Commerce technologies in India: The role of organizational factors. *International Journal of Information Management*, *26*(6), 428–441. https://doi.org/10.1016/j.ijinfomgt.2006.08.001

Wang, W., Sadjadi, S. M., & Rishe, N. (2024, May). A survey of major cybersecurity compliance frameworks. In *2024 IEEE 10th Conference on Big Data Security on Cloud* (*BigDataSecurity*) (pp. 23–34). IEEE. https://doi.org/10.1109/BigDataSecurity62737.2024.00013

Zbąski, J. (2024, June 26). Scalability and flexibility in e-commerce: Handling traffic spikes and maintaining user experience. *Rigby Blog*. https://www.rigbyjs.com/blog/ecommerce-scalability-and-flexibility