Perceived Risk and Consumer Behavior in E-Commerce: A Systematic Review of Security, Privacy, and Trust

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Abstract

Background: The rise of e-commerce has intensified focus on perceived risk, particularly in terms of security and privacy, as a key determinant of purchasing behavior. **Objectives:** (i) To synthesize how purchasing decisions and behavior influence perceived risk and concerns about security/privacy; (ii) To examine how behavior modulates this risk; and (iii) To identify specific factors that determine the level of perceived risk. **Methods:** A systematic review (PRISMA) of studies published between 2019 and 2024 in Scopus and Web of Science. Inclusion and exclusion criteria were applied. Additionally, a bibliometric co-occurrence analysis of keywords was conducted using VOSviewer. The final corpus included 63 studies. **Results:** Perceived risk (security/privacy) emerges as a central barrier, while trust, seller reputation, informational transparency, and technical robustness act as mitigating factors, increasing purchase intention. The relationship is bidirectional: greater digital experience and self-efficacy reduce perceived risk, whereas negative experiences increase it. **Conclusions:** Strengthening the triad of data protection, trust, and user experience consistently reduces perceived risk and supports the adoption of digital channels. Longitudinal designs and mixed-method approaches are recommended to capture the evolving nature of risk in light of emerging technologies.

Keywords: E-commerce; perceived risk; security and privacy; trust; consumer behavior

JEL classification: L81, M31, D81
Paper type: Research article

Received: 23 May 2025
Accepted: 14 July 2026

Acknowledgements: We gratefully acknowledge the Researcher Logistic Support Center of the Technological University of Peru, Chiclayo campus

Citation: Gonzales-Zarpan, L. M., Gamarra-Vera, E. A., & Gonzales-Torres, K. J. (2026). Perceived Risk and Consumer Behavior in E-Commerce: A Systematic Review of Security, Privacy, and Trust. *Business Systems Research, 17*(2), 166-191.
DOI: https://doi.org/10.2478/bsrj-2026-0024

Introduction

E-commerce, driven by the widespread adoption of mobile devices and improvements in internet infrastructure, has become a cornerstone of the digital economy (Desalegn et al., 2024). This expansion has reshaped consumer habits and transformed the effectiveness of advertising strategies (Nam et al., 2019). Studies such as those by Tatarinov et al. (2021) emphasize that globalization has enabled companies of all sizes to participate in the online marketplace, thereby creating greater opportunities for growth and competition. In this context, Shang et al. (2017) underscore the pivotal role of risk perception in digital purchases. Unlike face-to-face transactions, online shopping lacks physical interaction with vendors or products, creating uncertainty about the quality, reliability, and security of the buying process. This construct, known as perceived risk, encompasses the range of fears and concerns that arise from the potential for various types of loss when acquiring goods or services online. In recent years, systematic reviews have revealed conceptual fragmentation and methodological heterogeneity in measuring privacy and security risks in e-commerce, highlighting the need to integrate technological (data protection), psychosocial (trust), and contextual (regulation) dimensions into a unified framework (Phamthi et al., 2024).

Despite the rapid expansion of e-commerce, the evidence base on how security- and privacy-related perceived risk interlocks specifically with consumers' purchase decisions and behaviors remains fragmented. Prior work is dominated by adoption models (e.g., TAM/UTAUT) or treats risk as a broad antecedent of purchase intention, with heterogeneous samples and methods and limited integration of security, privacy, trust, usability, reputation, and service quality within the decision process. Moreover, few recent (2019–2024) Business/Management & Accounting SLRs combine PRISMA-based screening with VOSviewer keyword co-occurrence to jointly map these factors and assess the bidirectional link between behavior and perceived risk. This lack of a fine-grained, up-to-date synthesis motivates the present review.

Risk perception in online shopping encompasses financial dimensions (such as potential monetary loss) and psychological ones (such as anxiety due to the absence of physical contact) (Kamalul Ariffin et al., 2018). Additionally, social risk refers to the fear of disapproval from close social circles, while security and privacy risks are linked to concerns about the misuse of personal data (Saini, 2020). These variables significantly influence purchasing behavior. Technology through encryption, trust seals, and authentication systems bolsters consumer confidence by mitigating feelings of vulnerability; however, the effectiveness of these measures depends both on their accessibility and the trust they inspire (Strzelecki & Rizun, 2020). Recent evidence suggests that prior experiences with privacy and individual risk tolerance moderate the relationship between perceived security and purchasing behavior, offering a broader explanation for why equivalent security controls can elicit different responses among users (Tao et al., 2024).

Understanding perceived risk in online shopping is essential for designing marketing strategies that foster trust and reduce consumer uncertainty (Ma et al., 2025). Similarly, user protection policies can be strengthened by addressing key security and privacy concerns and promoting regulations that ensure transparency in data handling (Halan, 2020). The emergence of technologies such as artificial intelligence and m-commerce expands the possibilities for digital interaction yet also introduces new security challenges (Han et al., 2025). Moreover, the pandemic has accelerated the shift of both consumers and businesses to virtual environments, calling for longitudinal studies that can explain how perceived risk evolves in rapidly changing contexts (Jia et al., 2024). Reports from European payment authorities and consumer protection

agencies have raised alarms about the use of generative AI in phishing, spoofing, and deepfakes, which have heightened fraud sophistication and, consequently, increased consumer uncertainty in authentication processes and post-sale services (European Payments Council, 2024).

Privacy and cybersecurity take on heightened importance given the vast amount of personal data shared in e-commerce transactions (Park et al., 2025). This data includes sensitive information such as credit card numbers, addresses, and consumer habits, which can facilitate potential fraud (Mishra et al., 2022). Trust in digital platforms hinges on clear policies and the responsible use of such data, as their absence increases perceived risk and may discourage purchasing behavior (Alhalafi & Veeraraghavan, 2022). The implementation of measures such as multi-factor authentication and robust encryption certificates not only safeguards the integrity of information but also enhances the credibility of online vendors (Li et al., 2016).

Perceived risk in online shopping varies by age, gender, and education level. Younger users, more accustomed to technology, tend to worry less about security, whereas older consumers often display greater caution (Chakraborty et al., 2016; Pentz et al., 2020). Cultural context and institutional strength also play a role: in societies with high institutional trust and clear regulations, perceived risk is lower, while in regions with weak digital infrastructure or ambiguous policies, feelings of insecurity tend to rise (Goodell et al., 2021; Tudoran, 2024). These differences highlight the need to design risk mitigation strategies tailored to each demographic segment and cultural context.

The literature has identified key factors that influence the adoption or rejection of e-commerce, including users' familiarity with platforms, the seller's reputation, and the security guarantees provided (Isamudin & Islam, 2023). However, methodological inconsistencies persist due to the use of small sample sizes and particular contexts, which limit the generalizability of findings (Ilyas et al., 2020). Moreover, there is a notable lack of longitudinal analyses that could shed light on how perceived risk evolves and how external events such as economic crises or technological advancements may affect its fluctuation (Hoffmann, 2021).

A deep understanding of perceived risk in online shopping is vital for both marketing and consumer behavior research (Aiolfi et al., 2021). In practice, crafting strategies that reduce uncertainty and build trust can determine success in the highly competitive e-commerce landscape (Tarawneh et al., 2024). In the academic realm, developing theoretical models that integrate psychological, economic, and technological perspectives strengthens conceptual foundations and uncovers underexplored variables (Curth et al., 2020). Likewise, rigorous analytical frameworks guide the formulation of public policies and regulations aimed at protecting consumers and raising security standards on digital platforms (Kirillova et al., 2022). In this regard, convergence between academia and industry is essential to address the ongoing challenges posed by the evolving nature of e-commerce.

The relevance of studying risk perception in online shopping has grown alongside the widespread adoption of smartphones and the rise of m-commerce (Manchanda & Deb, 2021). The pandemic intensified this trend, forcing millions to rely on digital services and drawing attention to potential security failures (Grădinaru et al., 2022). Moreover, emerging technologies such as artificial intelligence, blockchain, and cryptocurrency payments are reshaping the dynamics of trust and risk by introducing new protective mechanisms as well as potential vulnerabilities into the shopping experience (Shih et al., 2021). For this reason, a longitudinal approach is essential to anticipate trends and design proactive responses in an ever-evolving digital landscape.

This study updates the field by synthesizing 63 peer-reviewed articles (2019–2024) and answering three questions centered on the intersection of purchase decisions/behaviors ↔ perceived risk in security and privacy. Its novelty lies in: (i) the integrated use of PRISMA-SLR and VOSviewer co-occurrence analysis (full counting, threshold ≥5, 80 terms) to derive six thematic clusters spanning technology, trust, usability, reputation, service quality, and risk dimensions; (ii) the explicit clarification of the bidirectional relationship between perceived risk and consumer behavior; and (iii) a targeted future-research agenda addressing concrete data-protection mechanisms, demographic heterogeneity, and emerging technologies (e.g., AI, blockchain, m-commerce) that reshape privacy/security perceptions within the online purchasing journey.

The foregoing has led to the formulation of the following objectives, each aligned with a corresponding research question: (i) To synthesize how purchasing decisions and behavior influence risk perception and concerns about security and privacy, aligned with the question: How do purchasing decisions and behavior influence risk perception and concerns about security and privacy among online shoppers; (ii) To examine how purchasing behavior modulates perceived risk, aligned with the question: In what ways does purchasing behavior affect risk perception, particularly regarding security and privacy, among e-commerce users; and (iii) To identify the specific decision making and behavioral factors that determine the level of perceived risk in digital shopping environments, aligned with the question: Which specific aspects of purchasing decisions and behavior determine the perceived level of risk in terms of security and privacy in digital shopping environments.

The manuscript is organized into five sections. Introduction: contextualizes the problem and outlines the research questions. Methodology: describes the design of the systematic literature review (SLR), the PIO/PICO formulation, the search strategy (databases, search equations), inclusion and exclusion criteria, PRISMA screening (with diagram), and details the bibliometric procedure (VOSviewer, co-occurrence analysis). Results: characterizes the corpus (temporal evolution, geographical distribution, document types, research approaches), presents VOSviewer maps and clusters, and offers a thematic synthesis addressing the research questions, supported by grouped citations and evidence tables. Discussion: contrasts the findings, offers theoretical implications, and suggests avenues for empirical verification. Conclusions: answer the research questions, summarize key implications, and outline a future research agenda.

Methodology

The methodology was based on a Systematic Literature Review (SLR), which involved selecting, analyzing, and evaluating studies to address the research questions. We examined works published over the past six years (2019–2024) on risk perception in online purchasing decisions, drawing from Scopus and Web of Science. We structured the research question using the PICO framework, defining the Population (P) as online shoppers, the Intervention/Exposure (I) as purchasing decisions, and the Outcome (O) as risk perception. Given the non-experimental nature of the included evidence, the Comparator (C) was inapplicable/heterogeneous; therefore, we operationalized PICO as P–I–O, in line with methodological guidance that permits variants for observational reviews.

Based on keyword identification and the application of inclusion and exclusion criteria during the search conducted on January 22, 2025, we developed the following search strategies for both databases, as detailed in Table 1.

Table 1
Inclusion criteria applied in the literature search in Scopus and Web of Science

Scopus	Wos
(TITLE-ABS-KEY ("online shopping" OR "E-commerce" OR "digital buying") AND TITLE-ABS-KEY (purchase OR decisions OR "consumer behavior" OR "shopping behavior") AND TITLE-ABS-KEY (risk OR perception OR security OR privacy)) AND PUBYEAR > 2018 AND PUBYEAR < 2025 AND (LIMIT-TO (SUBJAREA , "BUSI")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA , "all"))	"online shopping" OR "E-commerce" OR "digital buying" (Topic) AND purchase OR decisions OR "consumer behavior" OR "shopping behavior" (All Fields) AND risk OR perception OR security OR privacy (All Fields) and Article (Document Types) and English (Languages) and All Open Access (Open Access) and Business (Web of Science Categories) and Article (Document Types) and Business Economics (Research Areas) and 2024 or 2023 or 2022 or 2021 or 2020 or 2019 (Publication Years)

Source: Own elaboration

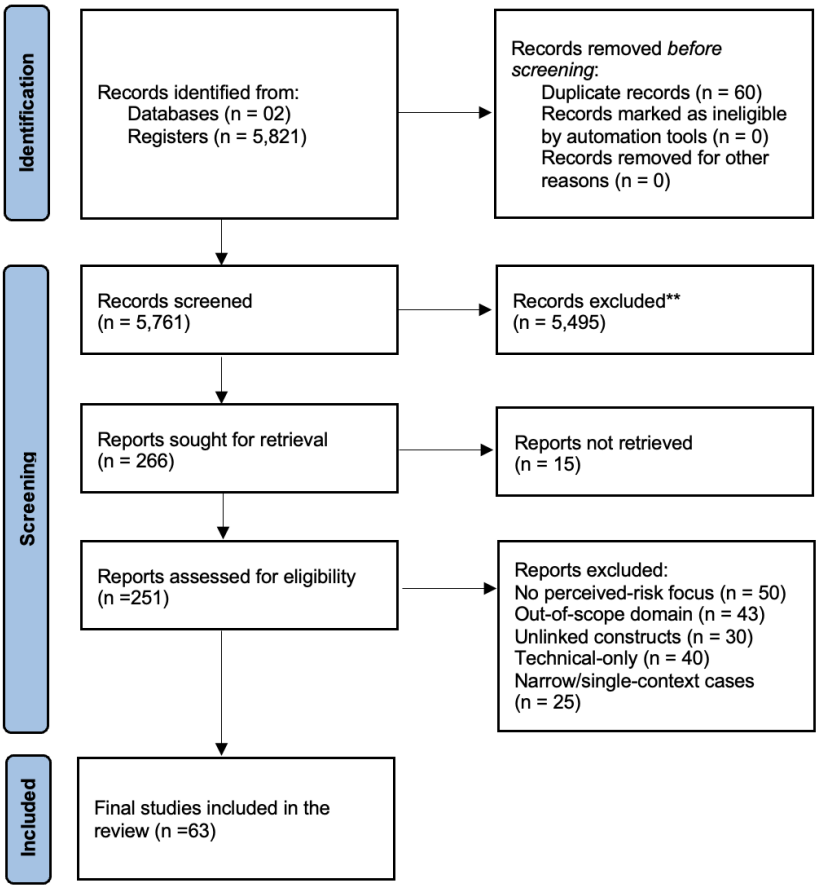
After entering the search formula into the Scopus and Web of Science databases, the PRISMA methodology (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guided the systematic review, ensuring transparency and reproducibility in study selection and evaluation. As shown in Figure 1, publications were first identified through searches in databases such as Scopus and WoS, using the predefined search equation. The initial search yielded 5,821 records; after removing 60 duplicates, 5,761 remained for screening.

For Scopus, in addition to the thematic equation, we applied the following inclusion criteria: Publication Years = 2019–2024; Subject Area = Business, Management and Accounting; Document Type = Article; Language = English; and Open Access = All Open Access. In Web of Science (WoS), the thematic query included: Document Types = Article; Languages = English; Open Access = All Open Access; Web of Science Categories = Business; Research Areas = Business Economics; and Publication Years = 2019–2024. These criteria excluded 5,495 documents that did not meet the requirements. As a result, 266 articles were retained for full-text review.

The researchers independently examined the topics, abstracts, titles, keywords, and full texts, excluding 188 documents for thematic irrelevance and an additional 15 that could not be retrieved. Among the 188 excluded studies, most were eliminated because they did not analyze consumer risk perception as a central construct in online purchasing decisions. Predominant among them were works focused on logistics/operations, finance, or technology adoption without explicitly linking risk–security and privacy to the purchasing decision. Others were confined to highly specific contexts (e.g., the COVID-19 pandemic, sectors such as food/fashion/tourism, or restricted populations) or addressed unrelated variables (e.g., satisfaction, loyalty, impulsiveness, perceived value) where "risk" was not an analytical focus. B2B/regulatory studies and methodological or AI-focused developments lacking a behavioral consumer perspective were also excluded. Additionally, 15 records could not be retrieved despite reasonable efforts.

Ultimately, 63 articles met the criteria and were accepted for inclusion in the development of the SLR. This systematic procedure ensures the rigorous consideration and evaluation of all relevant studies, thereby providing a solid foundation on which to base the conclusions of the review.

Figure 1
PRISMA Flow Diagram - Final studies included in the review



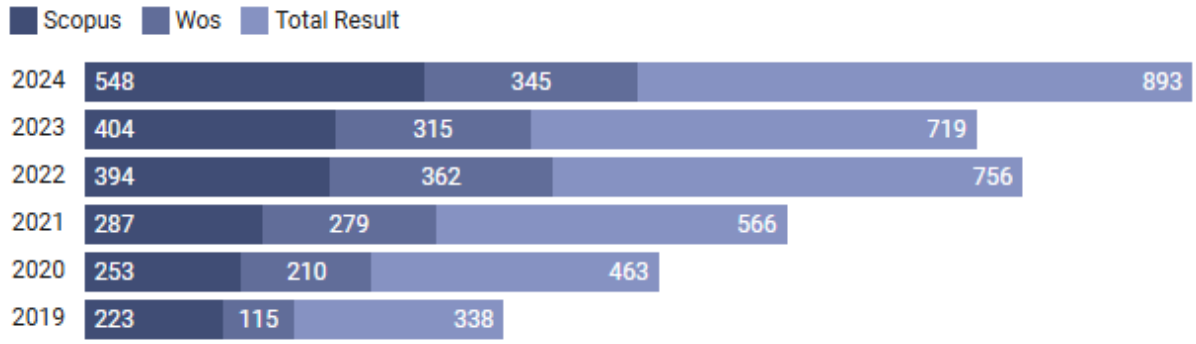
Source: Own elaboration
Note. Total records = 5,821, representing the raw initial retrieval before deduplication and screening. In PRISMA, duplicates removed = 60 (yielding 5,761 screened), with a final qualitative synthesis of n = 63.

Results

Results from descriptive analysis

Figure 2 shows that between 2019 and 2024, publications on risk perception in online shopping increased by 164% (from 338 to 893 articles). SCOPUS rose from 223 to 548 documents, and WoS from 115 to 345. Following steady growth from 2019 to 2022, there was a 4.9% decline between 2022 (756) and 2023 (719), followed by a 24.2% rebound in 2024 compared to 2023. In terms of share, SCOPUS maintained its lead, though with a slight decrease from 66.0% (223/338) in 2019 to 61.4% (548/893) in 2024, while WoS increased its share from 34.0% to 38.6% over the same period. This pattern of strong expansion from 2019 to 2022, adjustment in 2023, and recovery in 2024 confirms the consolidation of the field, driven by the maturation of e-commerce and growing interest in understanding how trust, security, and privacy shape purchasing decisions.

Figure 2
Number of Publications Per Year 2019 to 2024



Source: Own elaboration
Note: The 3,735 publications depict a field-level trend computed with disciplinary/type facets for contextualization.

Table 2 reveals, based on data from 21 countries, that between 2019 to 2024, risk perception in online shopping has become an area of growing academic interest worldwide over the past decade. Asia accounts for 65.8% of publications, driven by the rapid development of e-commerce and R&D in the region: China contributes 27.3%, India 13.5%, and Malaysia 4.2%. Europe contributes 15.2%, led by the United Kingdom (4.4%), Germany (3.4%), and Spain (2.5%), reflecting mature digital markets and strong consumer protection regulations. North America accounts for 13.6%, with the United States at 11.4% and Canada at 2.2%, reaffirming its pioneering role in technological innovation. In Oceania, Australia contributes 2.5%; in South America, nearly all publications come from Brazil (1.6%); and in Africa, the majority are from South Africa (1.3%). These disparities highlight the influence of factors such as internet access, market size, and policies promoting research.

Table 2
Publications by Country 2019 to 2024

Continent	Included Countries (Top 21)	Total Publication
Asia	China (27.3%), India (13.5%), Indonesia (4.4%), Malaysia (4.2%), Taiwan (4.1%), South Korea (3.3%), Vietnam (2.8%), Saudi Arabia (2.6%), Pakistan (1.9%), Thailand (1.7%)	**65.8%**
Europe	United Kingdom (4.4%), Germany (3.4%), Spain (2.5%), France (1.7%), Italy (1.7%), Portugal (1.5%)	**15.2%**
North America	United States (11.4%), Canada (2.2%)	**13.6%**
Oceanía	Australia (2.5%)	**2.5%**
South America	Brazil (1.6%)	**1.6%**
Africa	South Africa (1.3%)	**1.3%**
Total		**100.00%**

Source: Own elaboration
Note: Total publications included in this analysis = 3,735 (Scopus + WoS, 2019–2024). Percentages computed over this total (or column totals where specified).

Table 3 shows that, although multiple dissemination formats coexist, the article remains the dominant format in both databases. WoS includes 90.76% articles (followed by 4.12% review articles and 3.89% early access), while Scopus reports 57.79% articles and a significantly higher proportion of conference literature (28.68% conference papers and 4.79% conference reviews). Scopus also features a notable share of book chapters (5.62%) compared to only 0.05% in WoS, suggesting a more proceedings- and chapter-oriented ecosystem. Scientific correction mechanisms appear infrequently: in WoS, 0.72% are retracted publications and 0.05% are retractions; in Scopus, retractions, errata, and notes each account for 0.08%, while retracted publications are 0.0%. Overall, despite the greater weight of conference materials in Scopus, the article remains the principal channel for academic communication in the field.

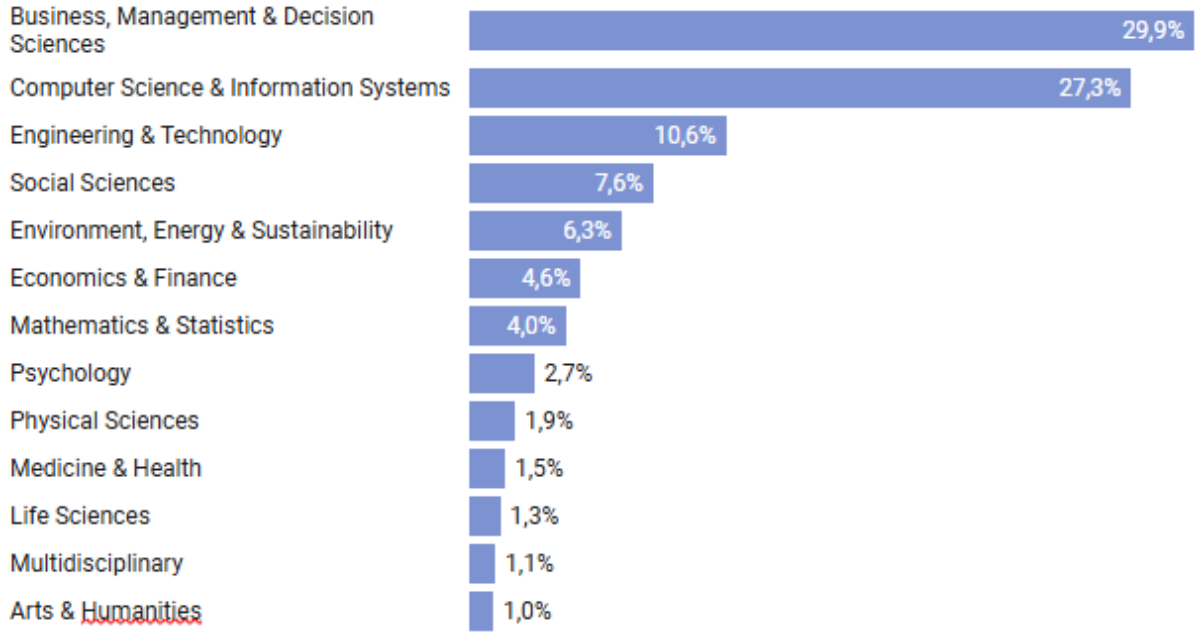
Table 3
Publications by Document Type

Document type	WOS	Scopus
Article	90.76%	**57.79%**
Review Article	4.12%	**2.33%**
Early Access	3.89%	**0.0%**
Conference Paper / Proceedings Document	0.27%	**28.68%**
Conference Review	0.0%	**4.79%**
Book Chapter	0.05%	**5.62%**
Books	0.0%	**0.47%**
Editorial Material	0.14%	**0.05%**
Retracted Publications	0.72%	**0.0%**
Retraction	0.05%	**0.08%**
Erratum	0.0%	**0.08%**
Note	**0.0%**	**0.08%**

Source: Own elaboration
Note: Universe = 5,761 records (Scopus + WoS) after duplicate removal from the initial search, before eligibility screening. Document-type categories follow each database's indexing; percentages (if shown) are computed within each database.

Figure 3 highlights the multidisciplinary nature of research on risk perception in online shopping. The two most prominent fields are Business, Management, and Decision Sciences (29.9%) and Computer and Information Sciences (27.3%), underscoring the importance of both organizational management and enabling technologies. At the second level are Engineering and Technology (10.6%) and Social Sciences (7.6%), reflecting interest in infrastructure, efficient processes, and sociocultural phenomena. Fields such as Environment, Energy, and Sustainability (6.3%), Economics and Finance (4.6%), and Mathematics and Statistics (4.0%) point to ecological, economic, and quantitative concerns. With less than 3%, Psychology, Medicine and Health, and Arts and Humanities contribute perspectives on behavior, virtual well-being, and cultural dimensions. Taken together, the distribution confirms a multidisciplinary phenomenon, comprising the 13 main categories selected from both Scopus and WoS to provide a synthetic view of the breadth and diversity of studies in this field.

Figure 3
Publications by Field of Study



Source: Own elaboration
Note. Universe = 5,761 unique records (Scopus + WoS) after duplicate removal from the initial search, prior to eligibility screening.

Figure 4 illustrates how, after extracting data from SCOPUS (CSV) and Web of Science (text format), VOSviewer was used to analyze the co-occurrence of 80 author keywords using full counting and a minimum threshold of five occurrences. The analysis, detailed in Table 4, revealed six thematic clusters: the first focused on technologies and innovation (machine learning, blockchain, data mining, privacy, and security); a second centered on risk perception and trust, including factors such as COVID-19 and service quality; a third oriented toward technology adoption using the TAM model and purchase intention; a fourth dedicated to website quality and satisfaction assessed through SEM; a fifth addressing consumer behavior in B2C and m-commerce contexts; and, finally, a sixth cluster incorporating emerging trends such as augmented reality and sustainability, thus reflecting the diversity and complexity of e-commerce. Overall, this co-occurrence map reveals the convergence of technological, behavioral, and security dimensions underpinning e-commerce development and adoption.

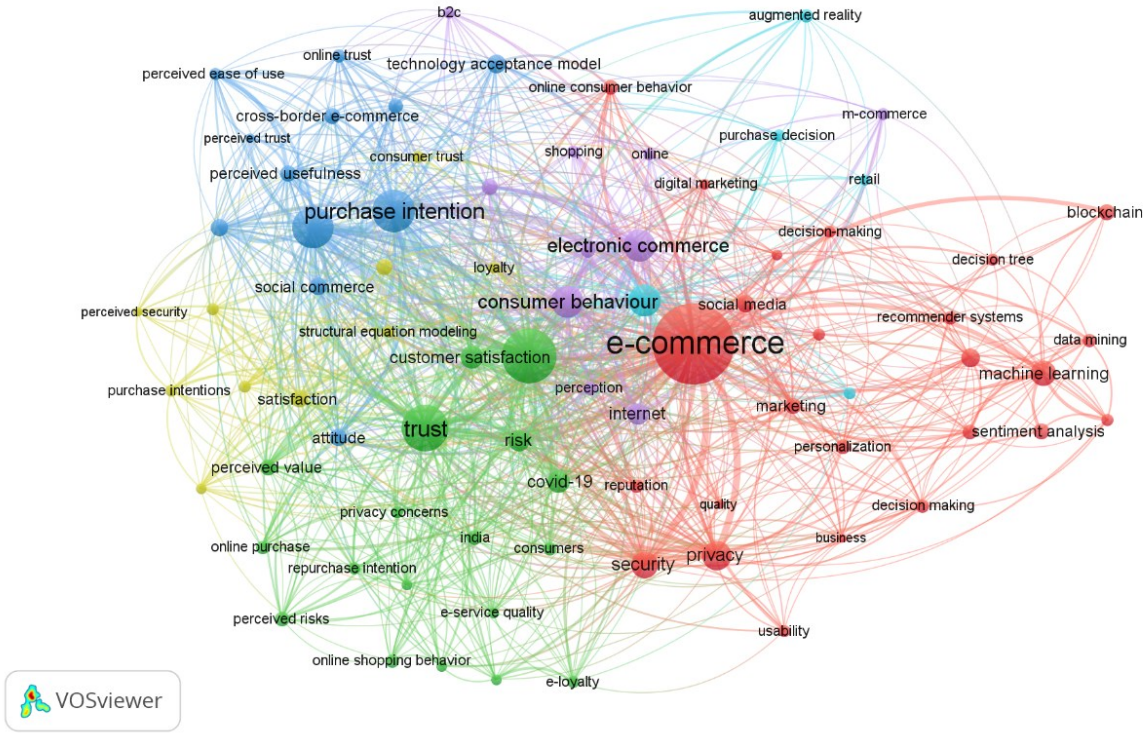
Table 4
Clusters Resulting from VOSviewer Processing

Cluster	Co-ocurrencias
Cluster 1	artificial intelligence, big data, blockchain, business, data mining, decision making, decision tree, decision-making, deep learning, digital marketing, e-commerce, ecommerce, machine learning, marketing, online consumer behavior, online marketing, personalization, privacy, quality recommender systems, reputation, security, sentiment analysis, social media, usability.

Cluster 2	Consumers, convenience, COVID-19, customer satisfaction, e-loyalty, e-satisfaction, e-service quality, ease of use, India, online purchase, online shopping, online shopping behavior, perceived risks, perceived value, privacy concerns, repurchase intention, risk, trust.
Cluster 3	Attitude, cross-border e-commerce, online purchase intention, online trust, perceived ease of use, perceived risk, perceived trust, perceived usefulness, purchase intention, social commerce TAM, technology acceptance.
Cluster 4	consumer trust, gender, loyalty, Malaysia, perceived security, purchase intentions, satisfaction, service quality, structural equation modeling, website quality.
Cluster 5	b2c, consumer behavior, e-business, electronic commerce, internet, internet shopping, m-commerce, online, perception, shopping.
Cluster 6	augmented reality, consumer behavior, purchase decision, retail, sustainability.

Source: Own elaboration

Figure 4
Bibliometric Results of the Scopus and WoS Articles



Source: Own elaboration
Note: Network built from the post-deduplication corpus (N = 5,761 records; Scopus + WoS, initial retrieval)

Focusing on the selected articles, this Systematic Literature Review (SLR) was conducted based on 63 peer-reviewed scientific articles written in English, selected through strict inclusion criteria to ensure the quality and relevance of the sources analyzed. The studies considered were published between 2019 and 2024, covering a recent period that captures current trends and developments in the field of interest. The articles originate from a geographically diverse range of countries, including the

United States (12), the United Kingdom (13), Norway (5), Switzerland (4), India (3), Ukraine (3), Brazil (2), South Korea (2), Spain (2), Malaysia (2), South Africa (2), and Chile (2), as well as single contributions from Slovakia, Indonesia, New Zealand, Serbia, Poland, Canada, the Netherlands, the Czech Republic, and Germany. This multicultural and multiregional composition strengthens the external validity of the findings and offers a broad, contextualized perspective on the topic under study.

Results from content analysis

Regarding the research questions, the first is: How do purchasing decisions and behavior influence risk perception and concerns about security and privacy among online shoppers? Based on the studies reviewed, multiple perspectives emerge on how purchasing decisions and consumer behavior shape risk perception and concerns about security and privacy in digital environments. As summarized in Table 5, there is a clear consensus that purchasing decisions and consumer behavior both influence and are influenced by perceived risk and concerns over security and privacy. When trust is reinforced by elements such as encryption protocols, seller reputation, and trust seals, there is a noticeable decrease in the emphasis on perceived risks and a corresponding increase in purchase intention. Conversely, negative perceptions regarding data integrity or fear of fraud significantly hinder the adoption of e-commerce services.

Table 5
Result of the Formulation of Specific Problem 1

Category / Match	Main Authors	Main Summary
Security and Privacy as the Core of Trust	(Ardiansah et al., 2020; Carbonell et al., 2019; Ghosh, 2024; Jadil et al., 2022; Khoa & Huynh, 2022; Falahat et al., 2019; Qalati et al., 2021; Schmidt et al., 2020; Tjahjana et al., 2024; Wijaya et al., 2023)	Data protection measures and security features (e.g., secure payment methods, trust seals) reinforce user trust and boost purchase intention. Perceived reliability of the platform reduces fear of data misuse, thereby increasing willingness to shop online.
Perceived Risk as a Key Barrier in Purchase Decisions	(Abarna et al., 2023; Alrawad et al., 2023; Amirtha et al., 2020; Chishty & Sayari, 2024; Higueras-Castillo et al., 2023; Hong et al., 2019; Indiani & Febriandari, 2021; Jabeen et al., 2024; Jiang et al., 2021; Khoa & Huynh, 2023; Kim & Han, 2022; Kráľ et al., 2022; Krawczyk-Sokołowska & Caputa, 2023; Lubis et al., 2022; Makhitha & Ngobeni, 2021; Nguyen et al., 2022; Rosillo-Díaz et al., 2024; Thi et al., 2023;	Concerns about fraud, data breaches or deception deter purchase behavior: higher perceived risk leads to lower likelihood of completing a transaction. Although few studies examine how buying decisions feedback into risk perception, they agree that data-security uncertainty fosters caution or distrust, negatively affecting online purchase intentions.

	Tran, 2020; Truong et al., 2022; Turhan, 2022; Wang et al., 2024; Wang & Chen, 2024; Zaza & Erskine, 2022)	
Contextual Factors and Multidimensionality of Risk	(Adomaviciute-Sakalauske & Urbonavicius, 2024; Barrantes-Aguilar et al., 2023; Bartók & Matošková, 2022; De et al., 2023; Ojochide et al., 2023; Gemar et al., 2019; Gotsch & Schögel, 2023; Han, 2019; Ju & Yoo, 2024; Lu & Zhang, 2020; Mou et al., 2020; Nagesh et al., 2024; Nuralam et al., 2024; Oghazi et al., 2021; Quintus et al., 2024; Rahman et al., 2021; Ravikumar et al., 2019; Sachdev & Sauber, 2023; Schomakers et al., 2020; Starostina et al., 2022; Sun & Li, 2021; Cuong, 2023; Tzeng & Shiu, 2020; Vásquez & Vera-Martínez, 2020; Yang et al., 2020; Yuniarti et al., 2022; Zhang et al., 2024)	Risk is treated as multidimensional—financial, contractual, social, psychological. Some studies highlight cultural aspects, pandemic context (COVID-19) or retailer ethics. Consumer response to security and privacy measures depends on external circumstances (e.g., surge in online shopping to avoid contagion), brand trust, and local regulations.
Privacy Paradox and Actual Behavior	(Gotsch & Schögel, 2023; Indiani & Febriandari, 2021; Schmidt et al., 2020; Schomakers et al., 2020)	Highlights the "privacy paradox," where consumers express high concern over data misuse yet frequently share personal information for convenience or personalized offers. Despite skepticism, actual purchase behavior often contradicts stated privacy concerns.
Influence of Trust and Reputation in Risk Reduction	(Carbonell et al., 2019; Ghosh, 2024; Jabeen et al., 2024; Jadil et al., 2022; Khoa & Huynh, 2023; Qalati et al., 2021; Rosillo-Díaz et al., 2024; Tzeng & Shiu, 2020; Wang & Chen, 2024)	Examines how seller reputation, information credibility, and platform quality mitigate risk perception. Enhancements in user experience (reliable reviews, return policies, clear terms) lower uncertainty and enhance purchase intention.

		While privacy concerns are not always analyzed in depth, a trustworthy environment consistently reduces perceived risks and encourages online consumption.
Purchase Decisions and Behavior in Response to Perceived Threat	(Barrantes-Aguilar et al., 2023; Higueras-Castillo et al., 2023; Hong et al., 2019; Indiani & Febriandari, 2021; Kráľ et al., 2022; Nguyen et al., 2022; Starostina et al., 2022; Tran, 2020; Truong et al., 2022; F. Wang et al., 2024)	Consumers adjust behavior when facing perceived risk: they may choose merchants with stronger security assurances, switch purchase channels, or abandon transactions. During the pandemic, many opted for online shopping as a safer alternative. However, if security and privacy safeguards are deemed insufficient, purchase intention weakens, illustrating the reciprocal relationship between behavior and risk perception.

Source: Own elaboration

To answer the second research question: In what ways does purchasing behavior affect risk perception, particularly regarding security and privacy, among e-commerce users? The review reveals that the examined studies present several perspectives on how purchasing behavior may influence risk perception, particularly in the context of security and privacy in e-commerce. As illustrated in Table 6, the overall picture suggests a reciprocal relationship: purchasing behavior can either mitigate or intensify risk perception depending on the user's experience and level of trust, while at the same time, perceived risk itself shapes how individuals engage in shopping activities, either encouraging or discouraging the adoption of e-commerce services.

Table 6
Results of the Formulation of Specific Problem 2

Category / Match	Main Authors	Main Summary
Greater Experience Reducing Perceived Risk	(Adomaviciute-Sakalauske & Urbonavicius, 2024; Alrawad et al., 2023; Ju & Yoo, 2024; Khoa & Huynh, 2023; Oghazi et al., 2021; Qalati et al., 2021; Quintus et al., 2024; Wang et al., 2024)	These studies show that as users gain more experience with e-commerce platforms, their concerns about fraud and data misuse decrease. Familiarity with purchase channels, positive reinforcement from successful transactions, and knowledge of available security measures all

		contribute to lowering perceived security and privacy risks.
Behavior Adjustment According to Risk Level	(Ardiansah et al., 2020; Bartók & Matošková, 2022; Ghosh, 2024; Hong et al., 2019; Khoa & Huynh, 2022; Makhitha & Ngobeni, 2021; Nguyen et al., 2022; Yang et al., 2020; Yuniarti et al., 2022)	Emphasizes the direct influence of privacy and security concerns on purchase behavior. Users adjust purchase frequency or type, choose sellers with high reputations, or scrutinize reviews more closely when they fear breaches of their personal information. Although the privacy dimension isn't always separately analyzed, there is consensus that consumer behavior responds to perceived threats.
Trust Reinforcement Mitigating Perceived Risk	(Jadil et al., 2022; Kim & Han, 2022; Rosillo-Díaz et al., 2024; Schmidt et al., 2020; Sun & Li, 2021; Tjahjana et al., 2024; Tzeng & Shiu, 2020; Wijaya et al., 2023)	Consumers feel more secure when they see clear data-handling policies, strong encryption, or trust seals. As positive shopping experiences validate these perceptions, concerns over security and privacy diminish. While not all authors detail exactly how trust is built step by step, they agree that once established, perceived risk becomes less influential on purchase intention.
Self-Efficacy and Digital Familiarity as Modulating Factors	(Adomaviciute-Sakalauske & Urbonavicius, 2024; Bartók & Matošková, 2022; Lubis et al., 2022; Quintus et al., 2024; Sachdev & Sauber, 2023)	Highlights that technological skills and self-efficacy enable buyers to better manage information, recognize security cues, and thus perceive less risk. However, in many cases privacy is only mentioned tangentially, with more emphasis placed on usability or fear-reduction

		aspects of fraud prevention.
Bidirectionality and Reciprocal Dynamics	(Chishty & Sayari, 2024; De et al., 2023; Gemar et al., 2019; Han, 2019; Jabeen et al., 2024; Jiang et al., 2021; Falahat et al., 2019; Mou et al., 2020; Nagesh et al., 2024; Ravikumar et al., 2019; Schomakers et al., 2020; Tran, 2020; Truong et al., 2022; Wang et al., 2024)	Suggests that purchase behavior not only is influenced by perceived risk but also alters it: a satisfactory purchase can reduce anxiety, whereas a negative experience increases caution. Multiple studies note the role of prior experience and seller reputation in reinforcing trust or, conversely, heightening apprehension about security and privacy after problematic transactions.

Source: Own elaboration

Finally, regarding the third research question: Which specific aspects of purchasing decisions and behavior determine the perceived level of risk in terms of security and privacy in digital shopping environments? The reviewed literature identifies multiple factors that influence perceived risk levels related to security and privacy in e-commerce. As shown in Table 7, when users perceive that a platform provides effective complaint mechanisms and clear policies to address potential issues, their sense of risk is significantly reduced. However, it is important to note that several authors do not explore security and privacy factors in isolation; instead, they address them as part of a broader spectrum of risks—including financial risk, product quality, and delivery risk, which can all shape the overall online shopping experience.

Table 7
Result of the Formulation of Specific Problem 3

Category / Match	Main Authors	Main Summary
Trust in the Seller and Platform Reputation	(De et al., 2023; Hong et al., 2019; Jadil et al., 2022; Khoa & Huynh, 2023; Falahat et al., 2019; Qalati et al., 2021; Wang et al., 2024; Wijaya et al., 2023)	Authors indicate that perceived security heavily depends on consumers' image of the seller (credibility, reputation, trust seals, positive reviews). When a platform has a strong reputation and transparent practices, concerns about fraud or data misuse are alleviated, reducing perceived risk.
Information Quality and Policy Transparency	(Ardiansah et al., 2020; Bartók & Matošková,	These studies emphasize that clear,

	2022; Quintus et al., 2024; Sun & Li, 2021; Tran, 2020; Yuniarti et al., 2022)	comprehensive information (product features, payment terms, privacy policies) builds trust and reduces perceived security and privacy risk. Conversely, vague or incomplete information increases uncertainty and vulnerability.
Multidimensional Nature of Risk (Financial, Product, Delivery, Privacy)	(Alrawad et al., 2023; Hong et al., 2019; Khoa & Huynh, 2023; Krawczyk-Sokołowska & Caputa, 2023; Makhitha & Ngobeni, 2021; Nagesh et al., 2024; Nguyen et al., 2022; Qalati et al., 2021; Tran, 2020)	These authors view perceived risk as encompassing multiple dimensions: not only financial or product risk but also potential misuse of personal data (privacy). The combination of these elements determines consumers' overall risk perception, with security and privacy as key components of uncertainty in e-commerce.
Prior Experience and Platform Familiarity	(Adomaviciute-Sakalauske & Urbonavicius, 2024; Chishty & Sayari, 2024; Fehrenbach & Herrando, 2021; Indiani & Febriandari, 2021; Khoa & Huynh, 2022; Quintus et al., 2024)	Emphasizes that technological familiarity and past successful shopping experiences lower risk perception. Consumers with higher digital proficiency more easily recognize security cues (HTTPS, encryption, trust seals), so the learning curve reduces anxiety about security incidents or data breaches.
Service Quality and Website Usability	(Ardiansah et al., 2020; Bartók & Matošková, 2022; Rosillo-Díaz et al., 2024; Wang & Chen, 2024; Yang et al., 2020)	Groups studies linking usability, easy navigation, and customer support to privacy perceptions. A site offering data-protection tools, privacy settings, and intuitive design reduces user uncertainty. However, in some cases privacy is

		mentioned only tangentially, without an in-depth discussion of specific protection mechanisms.
Retailer Ethics and Dispute Resolution	(Gotsch & Schögel, 2023; Kim & Han, 2022; Lu & Zhang, 2020; Oghazi et al., 2021; Vásquez & Vera-Martínez, 2020; Yuniarti et al., 2022)	Some works highlight business ethics, promise fulfillment, and transparency as factors affecting perceived security. Effective problem resolution (refunds, returns, after-sales service) also reduces fear of fraud or data misuse. However, not all studies explore the privacy dimension or how these policies concretely lower risk.

Source: Own elaboration

Across the 63 studies, concerns about fraud, payment security, and the misuse of personal data were generally associated with lower purchase intention. Consumers responded to these concerns by checking seller reviews, choosing more reputable platforms or secure payment options, and sometimes abandoning transactions. The evidence also suggests that prior shopping experiences can shape subsequent risk perceptions. Familiarity with online shopping and successful transactions were generally associated with lower perceived risk, while negative experiences heightened caution. Across the reviewed studies, seller reputation, transparent data-handling policies, visible security safeguards, and effective dispute resolution emerged as recurring factors associated with greater trust and lower perceived risk.

Discussion

This study aimed to clarify how perceived risk—particularly concerning security and privacy influences consumer purchasing decisions in e-commerce. The results of this review show that a high level of perceived risk can reduce purchase intention, which aligns with the findings of Starostina et al. (2022), who note that despite the pandemic-driven growth in digital shopping, concerns related to financial and functional risks persist. Similarly, Thi et al. (2023) emphasize the importance of cultural nuances, reflecting our observation that risk aversion varies across contexts, though it can be offset by trust-building strategies such as data encryption and transparent policies.

Additionally, the concept of risk as a multidimensional phenomenon, mentioned by Nagesh et al. (2024), and the emphasis on seller reputation noted by De et al., 2023), reinforce our conclusion that trust is a key axis in consumer engagement. However, our results slightly diverge from those of Jadil et al. (2022), who highlight the relevance of business size, whereas our findings suggest that data protection and platform transparency outweigh the mere perception of organizational scale. Moreover, the studies by Alrawad et al. (2023) and Jabeen et al. (2024) support the strong negative influence of privacy-related risks, as well as the mediating role of trust in decision-making, consistent with our proposition that the sense of security shapes continued platform use.

Regarding demographic factors and life stages Amirtha et al. (2020); Nguyen et al. (2022) and Tri (2023) both our study and these sources underscore that familiarity, prior purchasing experience, and post-purchase satisfaction significantly reduce anxiety about the misuse of personal information. Nevertheless, the degree to which each consumer segment balances convenience against perceived risk may vary depending on cultural and generational aspects. Regarding the answers to the research questions posed, we have the following:

How do purchasing decisions and behavior influence risk perception and concerns about security and privacy among online shoppers? The review's findings reveal that confident and informed purchasing behavior tends to minimize perceived risk (Carbonell et al., 2019; Jadil et al., 2022; Schmidt et al., 2020). The robustness of security protocols and transparency in data usage strengthen consumer trust and, in turn, reduce privacy concerns (Tjahjana et al., 2024; Wijaya et al., 2023). However, when users perceive a lack of guarantees regarding information protection, purchase intention decreases, highlighting the direct influence of purchasing behavior on how consumers assess potential risks (Alrawad et al., 2023; Kim & Han, 2022).

In what ways does purchasing behavior affect risk perception, particularly regarding security and privacy, among e-commerce users? The studies highlight a bidirectional dynamic: greater experience and satisfaction with previous purchases correlate with lower anxiety about potential fraud or data breaches (Ghosh, 2024; Higueras-Castillo et al., 2023; Indiani & Febriandari, 2021). On one hand, users who adopt cautious practices such as verifying seller reputation and analyzing reviews reinforce their sense of security. On the other hand, high perceived risk prompts adjustments in behavior, such as seeking more reputable platforms or encrypted payment methods, thus illustrating a reciprocal impact between purchasing behavior and concerns over privacy (Chishty & Sayari, 2024; Lubis et al., 2022).

Which specific aspects of purchasing decisions and behavior determine the perceived level of risk in terms of security and privacy in digital shopping environments? Among the most relevant factors are trust in the seller, platform reputation, information quality, and transparency in data handling policies (De et al., 2023; Qalati et al., 2021; Tran, 2020). Likewise, prior experience and technological familiarity influence risk assessment: users with greater proficiency in digital tools are more adept at identifying security cues and experience less fear (Fehrenbach & Herrando, 2021; Quintus et al., 2024). Lastly, retailer ethics, dispute resolution capabilities, and clarity in return policies also have a direct impact on trust, shaping the perception of risk associated with the exchange of personal data (Gotsch & Schögel, 2023; Kim & Han, 2022).

Regarding recommendations for future research, we suggest prioritizing longitudinal and comparative designs that capture the evolution of perceived risk in response to emerging technologies (e.g., AI, blockchain) and across various contexts (B2C, C2C, cross-border). It is advisable to experimentally test specific data protection measures (trust seals, MFA, return policies, cookie notices) and track their long-term effects. Standardizing risk taxonomies and measurement scales (financial, product, delivery, security/privacy) is essential to enable robust meta-analyses. We also recommend mixed-method approaches that link perceptions to observed behaviors (conversion, cart abandonment, returns) and include analysis of demographic and contextual moderators (age, gender, digital literacy, culture, socioeconomic status).

This review has several limitations. First, source coverage was limited to Scopus and Web of Science, which may have led to the omission of relevant studies indexed in other repositories or in the gray literature. Second, the unavailability of some full-text documents prevented their inclusion in the full-text analysis, potentially affecting the

final pool of selected studies. Third, the conceptual and methodological heterogeneity among the studies (in terms of risk definitions, contexts, and metrics) made a meta-analysis unfeasible, necessitating a narrative synthesis instead. Fourth, the dynamic nature of e-commerce and regulatory frameworks means that the findings of this review are time-sensitive and may require updates to reflect recent developments. Fifth, in the bibliometric mapping using VOSviewer, the selection of parameters (author keywords, full counting, and a minimum threshold of five occurrences) may have influenced the co-occurrence structure and cluster configuration, thus limiting the generalizability of the thematic pattern identified.

Conclusion

This systematic review, based on 63 studies published between 2019 and 2024 in Scopus and Web of Science, confirms that perceived risk, particularly about security and privacy, is a central determinant of e-commerce adoption.

First, regarding how purchasing decisions and behavior influence perceived risk, we find that informed behavior supported by visible safeguards (encryption, trust seals, clear policies) reduces anxiety and increases purchase intention; in contrast, uncertainty over data use deters transactions.

Second, the evidence shows bidirectionality between behavior and risk: accumulated experience, digital self-efficacy, and positive outcomes reduce perceived risk, whereas negative events induce caution and abandonment.

Third, the specific factors that modulate risk levels include seller reputation and trust, the quality and transparency of information (terms, privacy, return policies), technical robustness (e.g., MFA, encryption), and ethical standards and dispute resolution capacity framed within a multidimensional risk structure (financial, product, delivery, and privacy).

In sum, strengthening the triad of data protection, trust, and user experience consistently reduces perceived risk and supports the sustained adoption of digital channels. As evidenced by the consistency across multiple studies reviewed, data protection, consumer trust, and user experience constitute the pillars that explain the co-determination between risk perception and purchasing behavior in digital environments. When these pillars are strong, perceived risk decreases, and e-commerce adoption is sustained; when they are weak, caution rises, and transactions are discouraged.

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