



Research article

Purchasing in the digital age: A meta-analytical perspective on trust, risk, security, and e-WOM in e-commerce

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ABSTRACT

This comprehensive meta-analysis investigates the significant factors influencing consumer decision-making in e-commerce. Predominantly focusing on the parameters of trust, perceived risk, perceived security, and electronic word-of-mouth (e-WOM), this study provides insightful revelations on their integral roles in shaping e-commerce purchasing decisions. The findings demonstrate that trust, perceived risk, perceived security, and e-WOM significantly influence consumers' e-commerce purchasing decisions. Perceived Risk plays a substantial moderating role in the relationship between Trust and e-commerce purchasing decisions, amplifying the importance of managing and minimizing risk in online transactions to cultivate consumer trust. Contrastingly, the roles of Perceived Security and e-WOM do not hold the same moderating effect on the trust-purchasing decision nexus, underscoring the direct yet unmoderated influence these factors have on e-commerce purchasing behaviors. Furthermore, The research reveals no significant size effect difference among respondents from high-income and low-income countries or between general internet users and online shoppers concerning the impact of trust on e-commerce purchasing decisions. This intriguing finding suggests the universal importance of trust in the digital purchasing landscape, irrespective of socio-economic status or the degree of e-commerce engagement. This study thus sheds new light on the complexities of e-commerce decision-making processes. It offers valuable insights for businesses aiming to enhance consumer trust and engagement in the expanding digital marketplace.

1. Introduction

The rapid advancement of digital technology and its integration into the global economy has brought about a new era, which is widely known as the digital age. This era has significantly transformed the way consumers purchase goods and services, as it has made it easier, faster, and more convenient to buy and sell products online [1]. To better understand these transformations, a study aims to delve into the intricate dynamics and complexities of the e-commerce industry. E-commerce platforms have revolutionized the traditional methods of doing business, from the way companies operate to the customer's purchasing journey. They have created a new paradigm shift in the way consumers interact with businesses by providing them with access to a plethora of products and services at their fingertips. Consequently, it is vital to gain a comprehensive understanding of the factors that shape online consumer behavior, as these factors significantly influence their decision-making process. These factors encompass trust, risk, security, and electronic word of mouth (e-WOM). Trust is a crucial factor in online transactions, as it enables consumers to feel safe and secure when sharing their personal and financial information online. Risk is another critical factor, as consumers need to evaluate the potential risks and benefits

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of purchasing products online. Security is also an essential factor, as consumers need to trust that their personal and financial information is protected and not vulnerable to cyber-attacks. Finally, electronic word of mouth (e-WOM) is a crucial factor, as consumers rely heavily on the opinions and recommendations of others when making online purchases (see Figs. 1–9).

This study delves into the critical role that trust, risk, security, and electronic word of mouth (e-WOM) play in influencing consumer behavior in the realm of e-commerce. Based on extensive research, these factors have been identified as pivotal in shaping consumers' online purchasing decisions. Since online transactions lack the physical presence of a seller, trust emerges as a critical factor as consumers rely on the credibility of e-commerce platforms and sellers to make their purchase decisions [2]. Perceived risk, which encompasses financial, product, and privacy concerns, directly affects consumer engagement with online shopping [3]. Therefore, it is essential to develop effective strategies to address and mitigate these perceptions. Security, closely linked with trust and risk, addresses growing concerns about data breaches and transaction safety, highlighting the importance of robust security measures in fostering a secure e-commerce environment [4]. Electronic word of mouth (e-WOM) has emerged as a powerful tool for influencing consumer perceptions and decisions through digital platforms, marking a significant shift from traditional word-of-mouth dynamics [5]. By focusing on these four elements, the study intends to provide a deeper insight into the e-commerce industry and its evolution in the digital age. Ultimately, this will help businesses to understand their customers better and to create effective strategies that meet their needs and expectations.

This research study aims to provide a comprehensive and in-depth understanding of e-commerce by critically examining and synthesizing various academic literature. The study focuses on the three core factors of trust, risk, and security in online buying, offering a meta-analytical perspective that aims to make a significant contribution toward assisting businesses, consumers, policy-makers, and researchers in navigating and influencing the digital marketplace. The existing literature has individually focused on these factors, but there is a need for more comprehensive research that integrates these elements to understand their nuanced interplay in shaping online consumer behavior. This research study aims to fill this gap by presenting a meta-analytical review of these factors, providing a detailed synthesis and analysis of these core elements, and extending the current boundaries of knowledge in the field. Through the study's comprehensive analysis of trust, risk, and security, it aims to offer valuable insights for academic researchers and practitioners, strategists, and policymakers involved in the continually evolving e-commerce landscape. The study discusses the interrelationships of these three factors, their combined influence on online purchasing behavior, and the implications for e-commerce strategy and operations. This research study is expected to make a significant contribution toward understanding e-commerce by providing a more integrated and nuanced perspective of the core factors of trust, risk, and security in online buying.

2. Theoretical framework, literature review, and hypothesis development

2.1. Technology Acceptance Model

The theoretical framework for this study is centered around the Technology Acceptance Model (TAM), which was originally proposed by Davis in 1989 [6]. The TAM is a widely recognized model that helps researchers understand the various factors that influence people's acceptance and usage of technology [7]. This model is especially relevant when examining consumer behavior in e-commerce contexts [8]. To build on the existing research in this area, this study expands the TAM by including additional factors such as trust, perceived risk, security, and electronic word-of-mouth (e-WOM). These factors are crucial for understanding how individuals make decisions and form attitudes towards e-commerce platforms. By conducting a comprehensive analysis of these factors, this study aims to provide a deeper insight into the adoption and continued use of e-commerce technology.

The Technology Acceptance Model (TAM) is a theoretical framework that explains how users' attitudes and behaviors toward technology adoption are influenced. According to TAM, two main factors, perceived usefulness (PU) and perceived ease of use (PEOU), determine users' acceptance of a technology [6]. In the context of e-commerce, PU refers to the extent to which a consumer believes that using an online shopping platform would provide benefits such as convenience, cost-effectiveness, and time-saving [9]. PEOU, on the other hand, refers to the extent to which a consumer perceives that using an online shopping platform would be easy, effortless, and straightforward [10]. The perceived ease of use is a crucial factor in determining users' acceptance of technology, as it reflects the user's perception of the complexity and difficulty involved in using the platform. By considering these factors, businesses can design

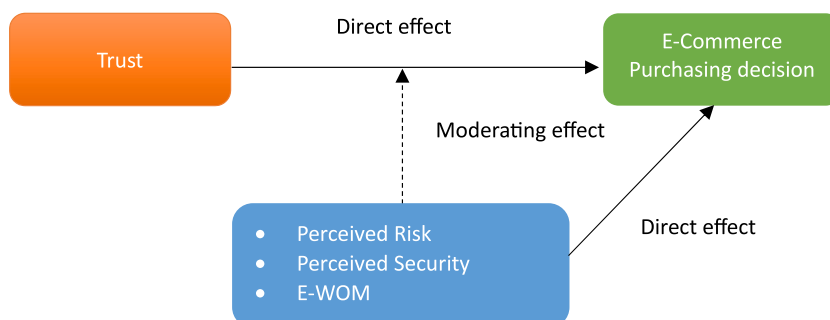


Fig. 1. Direct and moderating effect research framework.

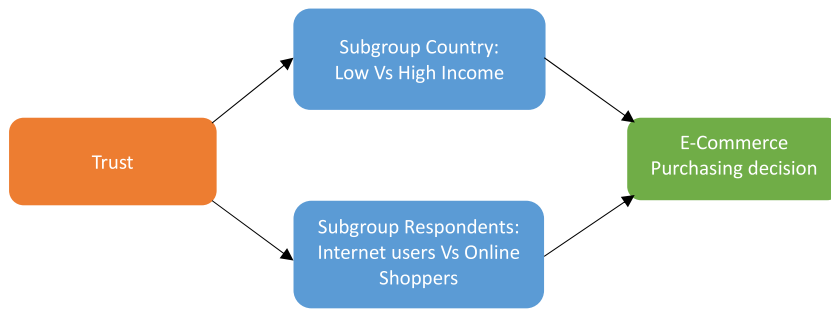


Fig. 2. Comparative research framework.

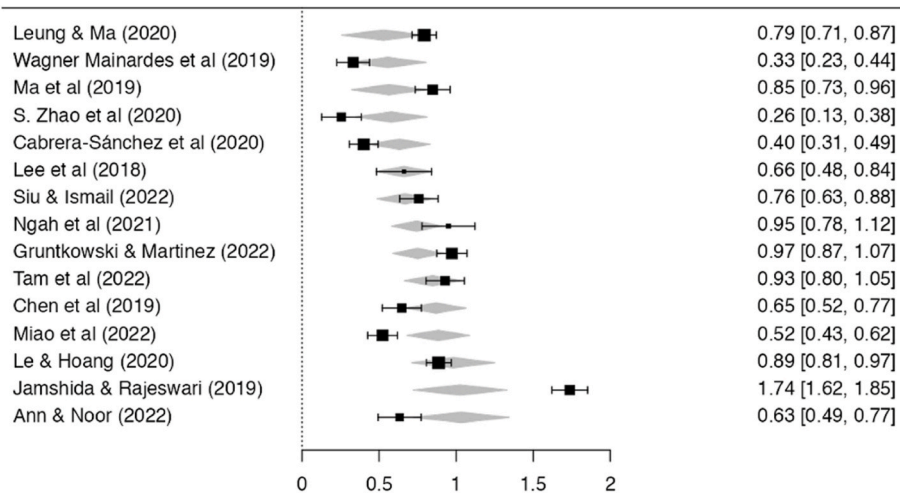


Fig. 3. Forest Plot of moderation perceived risk on trust.

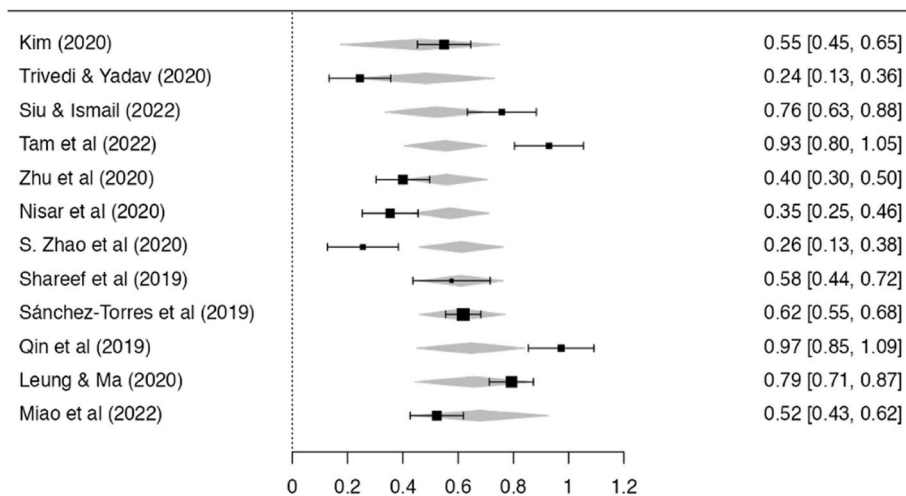


Fig. 4. Forest Plot of Moderation Perceived security on trust.

online shopping platforms that are user-friendly and efficient, leading to higher user adoption and satisfaction.

In the present era of digitalization, online shopping platforms have become the preferred choice for consumers who want to purchase goods and services. However, since these transactions take place in a virtual environment, consumers perceive a high level of risk associated with online transactions. To mitigate this risk, trust is a crucial factor that consumers consider when making purchasing decisions. Trust in e-commerce platforms refers to the consumer’s belief in the platform’s reliability and integrity, and it directly affects

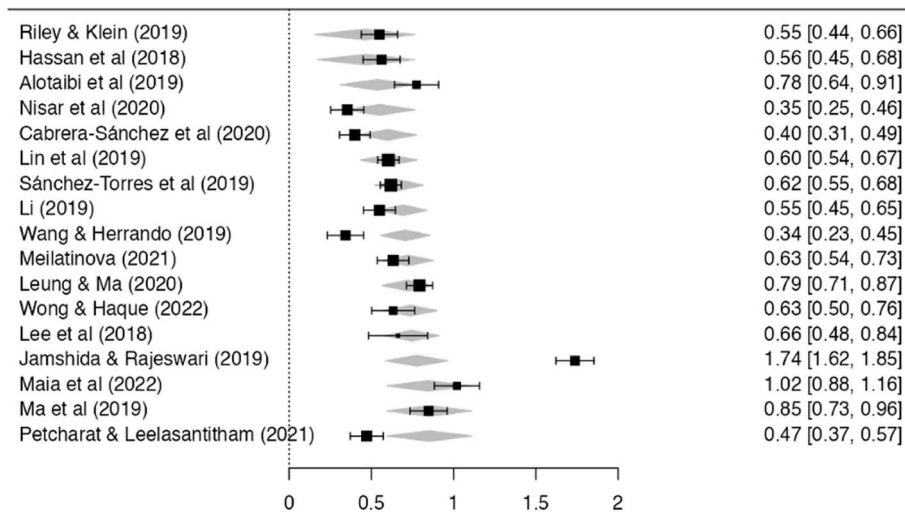


Fig. 5. Forest Plot of Moderation e-WOM on Trust.

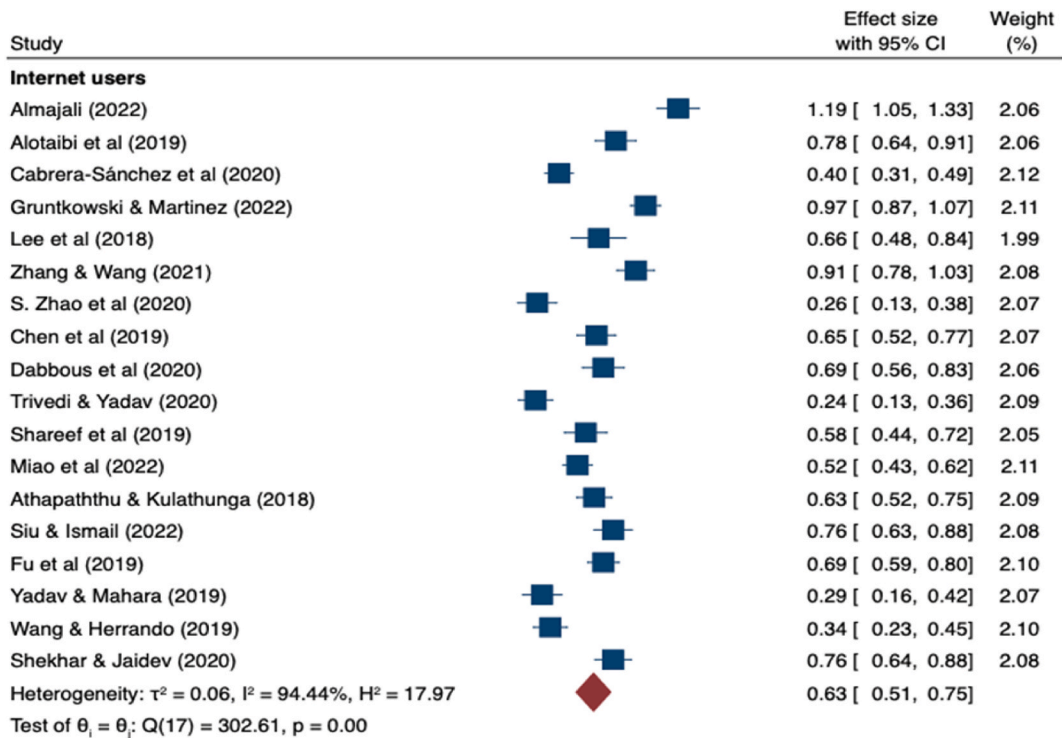


Fig. 6. Forest Plot of Subgroup analysis of Internet users.

the perceived usefulness of the platform [2]. Trust also indirectly reduces the perceived risk, which increases the likelihood of consumers accepting the technology [11]. This study highlights the importance of incorporating trust into the Technology Acceptance Model (TAM) framework to gain a better understanding of consumer behavior and technology adoption in the e-commerce industry.

In the realm of e-commerce, security is a crucial factor that cannot be ignored. It includes a range of technical and procedural measures designed to safeguard consumer data from unauthorized access, loss, or theft. These measures may consist of encryption, firewalls, access control, and monitoring systems. In the framework of the Technology Acceptance Model (TAM), security perceptions play a vital role in shaping people’s attitudes toward e-commerce platforms [2,11]. If users feel secure about their personal information, they are more likely to trust the platform and engage in transactions. However, if users perceive security risks, they may be hesitant to use e-commerce platforms altogether. Therefore, e-commerce businesses must prioritize security measures that instill

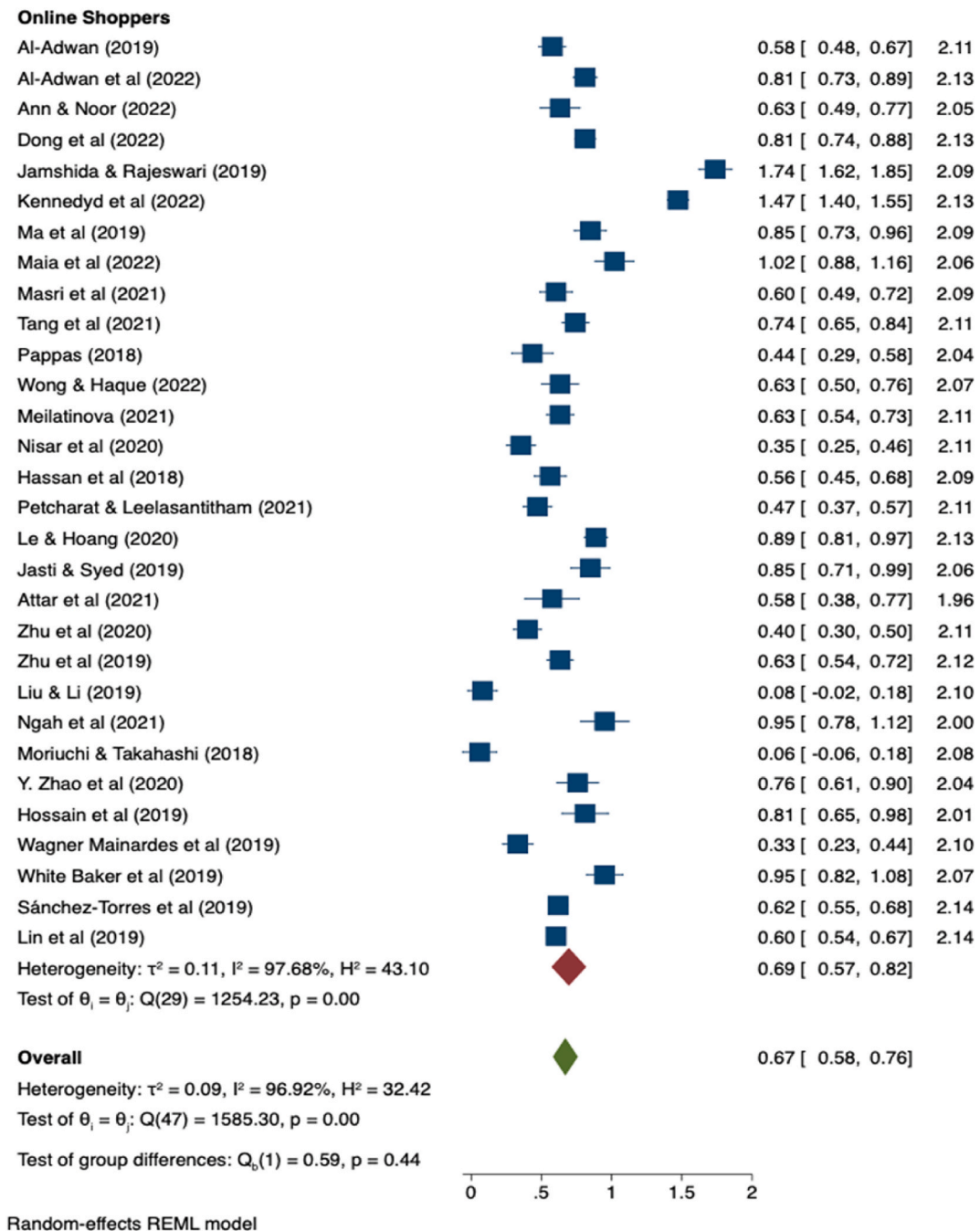


Fig. 7. Forest Plot of Subgroup analysis of online shoppers.

confidence in their users. This not only enhances the overall user experience but also helps to build a loyal customer base who feel safe and secure while using the platform.

Electronic word-of-mouth (e-WOM) refers to the impact of online reviews and personal recommendations on consumer behavior within the context of e-commerce [12]. According to the extended Technology Acceptance Model (TAM), e-WOM can significantly affect consumers' perception of an e-commerce platform's usefulness and trustworthiness [13]. Positive reviews and recommendations can increase the perceived value and credibility of the platform, which can ultimately influence consumer behavior and purchase decisions. Therefore, E-WOM has become a crucial aspect of the success of e-commerce businesses, as it can either enhance or detract from the overall customer experience.

The proposed extended Technology Acceptance Model (TAM) framework for this study is a theoretical approach that aims to

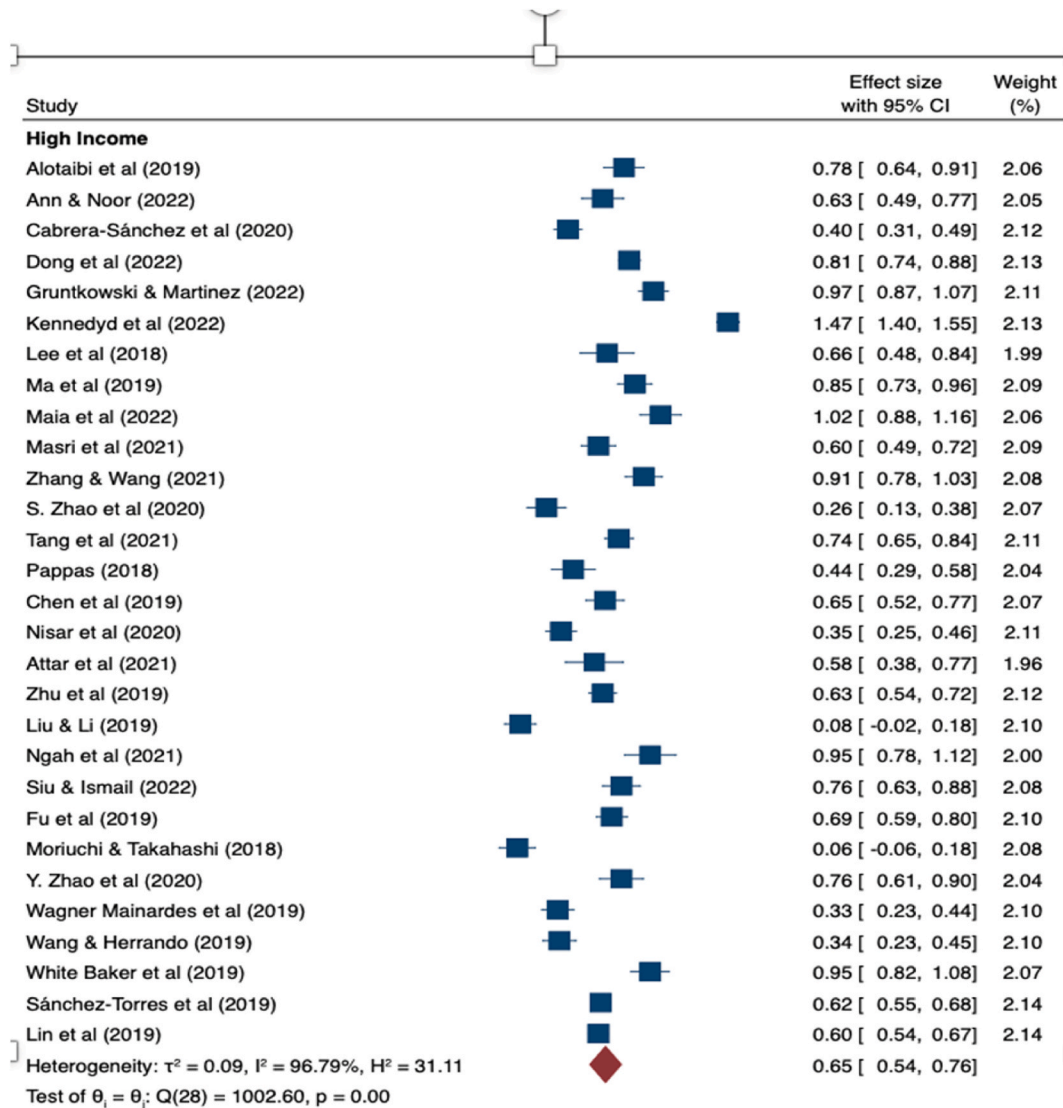


Fig. 8. Forest Plot of subgroup analysis of high-income Country.

provide a comprehensive understanding of the factors that influence the adoption and usage of e-commerce. This framework combines traditional TAM constructs with trust, perceived risk, security, and electronic word-of-mouth (e-WOM) to create a holistic understanding of the digital purchasing environment. By incorporating these important factors, the framework offers deeper insights into the challenges and unique characteristics of e-commerce. TAM considers the attitude towards technology usage as a direct antecedent of the intention to use it [14]. This approach adheres to the core principles of technology acceptance, providing a solid theoretical foundation for the study.

2.2. Trust and e-commerce purchasing decision

Trust is a critical factor in consumer interactions and decision-making when it comes to e-commerce. With the increasing prevalence of online shopping, trust has become even more important due to the lack of personal interaction, concerns over data privacy, and the reliability of service providers [2]. In the context of e-commerce, trust refers to a consumer's confidence in the online vendor's dependability and honesty, which encompasses the security of transactions and the safeguarding of personal information [15]. This trust is essential in reducing the perceived risks associated with online shopping, thereby encouraging consumers to participate in e-commerce activities. The literature highlights the crucial role of trust in mediating consumer perceptions and their subsequent purchasing decisions, indicating that a higher level of trust in an e-commerce platform is likely to lead to positive purchasing behaviors. Trust significantly impacts customer behavior, especially in ambiguous contexts like electronic purchasing and payment [16].

Trust, an essential construct in traditional commerce, has gained profound relevance in this new online context. The successful

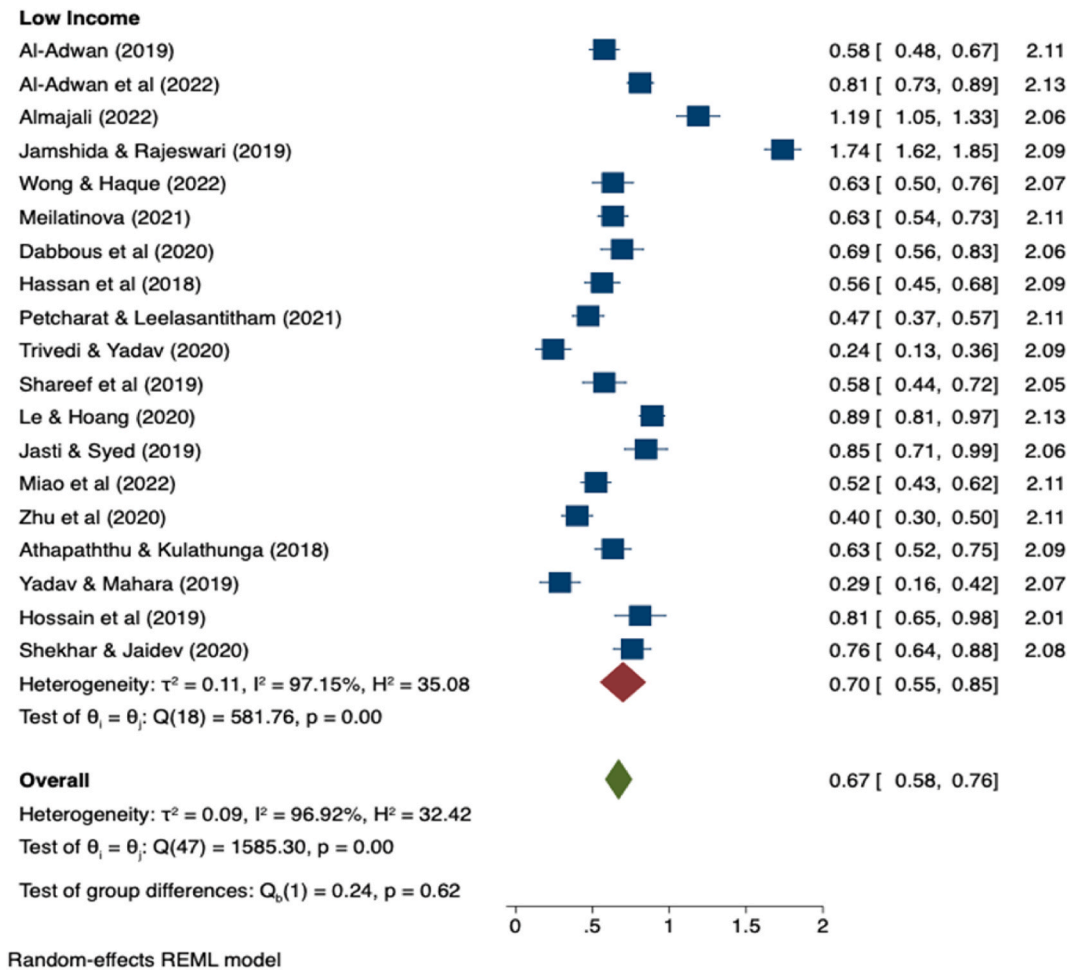


Fig. 9. Forest Plot of subgroup analysis of low-income Country.

operation and expansion of commerce through Internet platforms now depend heavily on trust [17]. Prior research suggests that trust plays a pivotal role in online consumer behavior, with a wide range of implications for the success or failure of e-commerce platforms [18]. Trust significantly influences consumers' attitudes and intentions toward online transactions [19]. Consumers' trust in an e-commerce platform reduces perceived risks associated with online transactions, encouraging more purchases [20]. Factors such as reputation, previous experience, site quality, and third-party seals have been identified as significant in building online trust [21]. Moreover, trust is also found to moderate the relationship between perceived website quality and purchase intentions [22].

Research indicates that trust is a crucial factor in both the intention to purchase and the actual purchasing behaviors of consumers in the realm of e-commerce [23]. Specifically, the trustworthiness of a platform is a significant influence on consumers' online purchasing intentions, with security and privacy being of utmost importance [24,25]. Furthermore, trust is a key factor in fostering consumer loyalty, which can lead to repeat purchases, as demonstrated. E-commerce platforms can enhance consumer trust by managing critical factors, such as website design, third-party certifications, and customer reviews, which have been identified as determinants of trust in this context. Numerous studies have established a correlation between trust and consumer behavior in e-commerce. Accordingly, it is widely believed that when consumers place greater trust in an e-commerce platform, they are more inclined to make a purchase [26]. A crucial factor in digital transactions, trust mitigates perceived risks and fosters consumer confidence and loyalty [11]. As such, online vendors should prioritize measures to cultivate trust, as doing so can bolster consumer trust and lead to increased purchases.

H1. Higher levels of consumer trust in an e-commerce platform will positively influence e-commerce purchasing decisions.

2.3. Risk and e-commerce purchasing decision

The realm of online shopping presents a plethora of thrilling possibilities for consumers. However, it also entails a fair share of perceived hazards that can significantly impact their purchase decisions. The idea of risk in e-commerce encompasses a wide range of

consumer concerns, such as financial loss, privacy breaches, and non-delivery of goods and services [27,28]. These risks can be classified into several categories: financial risk, product risk, service risk, psychological risk, and privacy risk [29,30]. All of these risks are linked to the uncertainty and possibility of negative outcomes in online transactions. Financial risk refers to the potential loss of money that consumers may suffer due to fraud or non-delivery of products [31,32]. Product risk entails uncertainty about the quality and authenticity of products bought online [28]. Service risk concerns the quality of customer service and support provided by online sellers [33,34]. Psychological risk relates to the personal feelings of regret or anxiety that may arise after a purchase [35,36]. Finally, privacy risk pertains to the potential misuse of personal and financial information submitted during online transactions [37,38].

Empirical studies have consistently demonstrated the negative impact of perceived risk on e-commerce purchasing intentions [39]. The study highlighted that the perceived risk of transacting online impacts consumers' trust and, subsequently, their willingness to purchase online. Bhatnagar and Misra [40] explored the types of risks associated with e-commerce. They categorized them into product, financial, time, convenience, and privacy risks. Each of these categories has been found to have a unique influence on the purchasing decisions of online shoppers. Studies by van der Heijden [41] and Zhou [42] examined how e-commerce interfaces and website quality can influence perceived risk and purchase intention. Both studies concluded that website quality could reduce perceived risk and enhance purchasing intentions. Marceda Bach and da Silva [43] highlight that factors such as the security and privacy of individual information play critical roles in shaping consumers' perceived risks associated with online purchases. Kamalul Ariffin and Mohan [28] provide empirical evidence supporting the assertion that perceived risks, especially those concerning the security of transactions, significantly reduce consumers' willingness to engage in online purchases.

To truly grasp how perceived risk influences consumer behavior in the realm of online shopping, a detailed examination of this phenomenon is required. Research indicates that financial and privacy risks are the primary factors that dissuade consumers from making purchases online [44]. However, it is crucial to acknowledge that perceptions of risk are subjective and can differ greatly from person to person. Various factors, such as personal experiences with online shopping, familiarity with the e-commerce platform, and digital literacy, can have a significant impact on these perceptions [45]. To foster a sense of trust and security among users, e-commerce platforms must implement effective strategies to mitigate perceived risks. By doing so, they can cultivate customer loyalty and increase sales. As the level of shopping risk increases, consumers' purchase intention tends to decrease. Conversely, when the risk of shopping is reduced, consumers' intention to buy shows an increase [46].

H2. Higher perceived risk in e-commerce will negatively influence purchase intentions.

2.4. Security and e-commerce purchasing decision

In the realm of e-commerce, trust is paramount to achieving success. Despite the convenience of online shopping, security uncertainties remain a significant obstacle to consumer adoption. The perceived level of security, or the confidence that customers have in a website's protective measures against unauthorized access and fraud, is crucial in establishing trust with online retailers [47]. This trust can significantly impact customers' purchasing decisions. To investigate how specific security features influence consumer behavior, researchers have employed various theoretical frameworks, including the Technology Acceptance Model (TAM). Through these models, researchers have discovered that having digital certificates, secure sockets layer (SSL) encryption, and clear privacy policies can significantly enhance consumers' perceptions of security, thereby increasing the likelihood of online purchases [2,4]. Research suggests that online retailers must prioritize robust security measures to assuage consumer apprehensions regarding online shopping. By doing so, they can build trust with their customers and improve their chances of thriving in the highly competitive e-commerce industry.

The e-commerce industry, while advantageous in its broad global reach and convenience, has grappled with security concerns since its inception. Increasing concern among consumers regarding the misuse of personal information and fraud hinders the e-commerce industry from growing. A study found that perceived risk, especially financial and product performance risks, significantly influenced online purchasing decisions [28]. Subsequently, Pavlou [39] added to the discourse by examining the role of trust in e-commerce. Trust was identified as a crucial factor in mitigating perceived risk in online transactions. Building upon this, Kim, Ferrin [21] concluded that website security features such as third-party security seals significantly influenced trust, affecting the likelihood of a consumer making an online purchase. In the last decade, with the increasing sophistication of cyber threats, the academic community has been paying more attention to the impact of perceived security on e-commerce.

Kamalul Ariffin and Mohan [28] study of the impact of consumers' perceived risks on online purchase intentions. They reveal that security risk is a primary concern deterring consumers from making online purchases. This study identifies financial risk, product risk, security risk, time risk, social risk, and psychological risk as key factors influencing online purchase intentions, with security risk being the most significant. It suggests that addressing security concerns can significantly mitigate perceived risks and positively influence consumers' willingness to engage in online transactions. Research has shown that trust seals from third-party certification programs, like TRUSTe and VeriSign, positively affect consumer trust in online transactions. These seals can have a significant impact on purchase intention, varying by seal type and product category. For instance, while some studies found no global effect for VeriSign or TRUSTe across all categories, others indicated a positive effect on trust and purchase intentions specific to certain types of products or services [48]. For businesses looking to attract and retain first-time visitors by reducing perceived risks and enhancing trust, investing in reputable third-party trust seals appears to be a highly effective strategy. This aligns with the broader understanding of trust as a central element in online transactions, successfully reducing uncertainty and perceived risk and thereby fostering a more secure and trustworthy e-commerce environment [49]. Seals act as indicators of trustworthiness and security competence, consequently assuring consumers regarding the safety of their transactions and boosting their confidence in the website's security measures.

H3. The presence of website security features positively influences consumers' online purchasing decisions

2.5. E-WOM and e-commerce purchasing decision

E-WOM, or electronic word-of-mouth, refers to the practice of sharing personal experiences, opinions, and recommendations about products, brands, or services online [50]. In our digital age, social media platforms, review sites, and online forums are becoming increasingly popular. As a result, electronic word-of-mouth (e-WOM) has emerged as a powerful influencer of modern consumers' purchasing decisions. Recent studies reveal that customers trust feedback and suggestions from other customers more than traditional advertising methods [51]. This is because e-WOM offers an authentic and genuine perspective that helps shoppers make informed choices [52,53]. Given its significant impact on consumer behavior, businesses can utilize e-WOM as a valuable tool to improve their brand visibility, build customer loyalty, and increase engagement. By leveraging e-WOM, companies can harness customer advocacy to create a positive reputation that resonates with their target audience.

To comprehend the impact of Electronic Word-of-Mouth (e-WOM) on e-commerce purchasing decisions, one must consider information adoption models. These models suggest that the effectiveness of e-WOM is reliant on the credibility of its source, the quality of the message, and how pertinent the information is to the consumer's needs [13,54]. Favorable e-WOM, including positive reviews and testimonials, has been discovered to significantly enhance consumers' confidence in a product or brand, thus increasing the likelihood of a purchase [55]. This phenomenon can be attributed to the social proof perception, whereby potential buyers feel more secure in their choices when they see others making similar decisions. While positive electronic word-of-mouth (e-WOM) has been shown to influence purchasing decisions, negative e-WOM also has an impact but weakening purchasing decisions.

Studies suggest that online customer reviews play a crucial role for consumers when making online purchases, particularly for products that cannot be personally evaluated before purchase. Positive customer reviews have been shown to positively influence consumer purchasing behavior, while negative reviews can deter potential purchases. These findings are supported by research examining various factors that influence the effectiveness of E-WOM, including content quality, the platform's characteristics, trust, and perceived risk, with trust identified as having the most substantial positive impact on purchasing habits [56]. The study underscores that e-WOM plays an intermediary role between SMC and brand equity, suggesting that positive e-WOM can enhance brand perception and trust alongside the influence of social media content generated by both firms and users [57]. Negative online consumer reviews can indeed influence consumers' attitudes toward products and, ultimately, their purchasing decisions. One study highlighted the changing consumer behavior due to the proliferation of internet use, where individuals rely on the opinions of other consumers when making decisions about purchases online. This reliance on online reviews serves as both decision aids and consumer feedback mechanisms, which can significantly influence purchasing decisions by reducing the perceived risk associated with online shopping [58].

H4. E-commerce purchasing decisions are influenced by e-WOM. Positive e-WOM increases e-commerce purchasing decisions, while negative e-WOM decreases them.

2.6. Moderating role of perceived risk

The digital landscape, particularly e-commerce, has grown rapidly, revolutionizing consumer behavior worldwide. Central to this transformation is the role of Trust and Perceived Risk. Trust, often conceptualized as a belief that an online retailer will behave reliably and ethically, significantly influences consumers' attitudes and decisions to transact online [15]. In contrast, Perceived Risk, which refers to a consumer's belief in the potential for loss in an online purchase situation [59], often acts as a barrier to online shopping [40]. Previous studies have established an inverse relationship between Trust and Perceived Risk, with higher levels of trust associated with lower perceived risk [19]. Trust helps consumers overcome the perceived risk of uncertainty and vulnerability inherent in online transactions [60]. While the individual impacts of Trust and Perceived Risk on online purchasing behavior have been well-documented, research into the moderating role of Perceived Risk in the relationship between Trust and e-commerce purchasing decisions still needs to be explored. In other words, understanding how varying levels of perceived risk might influence the strength and direction of the trust-purchasing behavior relationship is crucial to developing a more nuanced understanding of digital consumer behavior. Drawing from the existing body of literature and addressing the research gap, we propose investigating the moderating effect of Perceived Risk on the relationship between Trust and e-commerce purchasing decisions. The study posits the following hypothesis:

H5. Perceived risk moderates the relationship between consumer trust in an e-commerce platform and e-commerce purchasing decisions. The higher the perceived risk, the magnitude relationship between trust and e-commerce purchasing decisions will be reduced.

2.7. Moderating role of perceived security

With its rapid expansion of e-commerce, the digital era has necessitated a deeper exploration of the factors influencing online consumer behavior. Trust and Perceived Security are two such pivotal factors. Trust is often defined as the consumer's belief in the reliability and integrity of an e-commerce platform, and it is recognized as a significant influencer of online transaction decisions [19]. On the other hand, Perceived Security refers to consumers' beliefs regarding the protective measures an online retailer implements to safeguard transactions and personal information [61]. Several studies have demonstrated that trust mitigates the uncertainty and perceived risk associated with online transactions, promoting online purchasing behavior [19,60]. Likewise, perceived security boosts

consumer confidence in e-commerce platforms, reducing the perceived risk of online transactions and facilitating purchasing [61]. Despite the established significance of Trust and Perceived Security, there remains a need for more research examining the moderating role of Perceived Security on the relationship between Trust and e-commerce purchasing decisions. Understanding how Perceived Security may alter the influence of Trust on purchasing behavior could provide nuanced insights into the complexities of digital consumer behavior. Informed by existing literature and aimed at addressing this research gap, the study seeks to investigate the moderating role of Perceived Security on the relationship between Trust and e-commerce purchasing decisions. Specifically, the study proposes the following hypothesis:

H6. Perceived Security will moderate the relationship between Trust and digital purchasing behavior, such that the positive relationship between Trust and purchasing behavior will be stronger when Perceived Security is high.

2.8. Moderating role of e-WOM

The burgeoning growth of e-commerce, powered by the digital revolution, has prompted a renewed investigation into the factors shaping online consumer behavior. Trust, or a consumer's belief in the dependability and ethics of an e-commerce platform, is known to be a primary determinant of online purchasing decisions [15,19]. On the other hand, Electronic word-of-mouth (e-WOM) represents the exchange of information about products or services among consumers on online platforms, influencing the perceptions and decisions of potential buyers [62]. The existing body of research has repeatedly demonstrated that trust lowers the perceived risk and uncertainty inherent in online transactions, encouraging consumers to purchase more online [19,60]. E-WOM has simultaneously evolved as a powerful influencer of consumer behavior in the digital realm, helping to mold consumers' impressions of products and guiding their decision-making around purchases [63]. While the individual impacts of trust and e-WOM on online purchasing decisions have been studied extensively, there needs to be more research exploring the moderating role of e-WOM on the relationship between trust and e-commerce purchasing decisions. Unraveling how e-WOM might impact the strength or direction of the trust-purchasing behavior relationship could provide a more nuanced understanding of the digital consumer's decision-making process. Building on the extant literature and seeking to fill this research gap, the study aims to investigate the moderating role of e-WOM on the relationship between trust and e-commerce purchasing decisions. The study proposes the following hypothesis:

H7. E-WOM will moderate the relationship between Trust and digital purchasing behavior, such that the positive relationship between Trust and purchasing behavior will be stronger when positive e-WOM is high.

2.9. Typology respondents and e-commerce purchasing decision

According to a study, consumer demographics play a moderating role in e-commerce purchase decisions [1]. As the reach of e-commerce continues to expand across diverse economies, understanding the nuances of online consumer behavior becomes crucial. Central to this exploration is the construct of Trust, often defined as a consumer's belief in the integrity and reliability of an e-commerce platform [15]. Trust is recognized as a critical determinant of online transaction decisions, significantly influencing consumers' attitudes and intentions to engage in online transactions [19]. While the role of trust in driving e-commerce is well-established, there is a growing recognition of the need to explore how this role might vary across different economic contexts. Prior research indicates that contextual factors such as economic development, digital infrastructure, and cultural norms can influence consumers' trust in e-commerce and subsequent purchasing decisions [64,65]. Yet, the differential impact of trust on e-commerce purchasing decisions in high-income countries (HICs) versus low-income countries (LICs) still needs to be explored. Informed by the existing literature, the study seeks to investigate the influence of trust on e-commerce purchasing decisions across different economic contexts, particularly contrasting high-income and low-income countries.

Customers who fit into the low and medium-low socio-economic segments feared losing their money and financial data while using mobile commerce because, due to their poor economic condition, they were not ready to adopt mobile commerce [66]. Based on the literature mentioned above, the study proposes the following hypothesis:

H8. The influence of trust on digital purchasing behavior will differ between respondents from high-income countries and those from low-income countries.

The digital revolution and the subsequent proliferation of e-commerce have dramatically altered consumer behavior patterns. Trust is essential for encouraging consumers to engage in online transactions by reducing the perceived risks and uncertainties inherent in the digital marketplace [60]. However, understanding the role of trust in influencing e-commerce purchasing decisions may require a more nuanced exploration that considers the type of online users, specifically differentiating between general internet users and active online shoppers. Internet users may use the web for various activities, including information search, communication, entertainment, etc., but not necessarily for online shopping. In contrast, online shoppers are internet users who actively participate in e-commerce transactions. These different levels of engagement with e-commerce platforms may significantly influence trust formation and its impact on purchasing behavior [67]. Drawing upon the existing literature, the study proposes to investigate the differential impacts of Trust on e-commerce purchasing decisions between these two distinct groups: general Internet Users and Online Shoppers. The study posits the following hypothesis:

H9. The relationship between Trust and digital purchasing behavior will be stronger for Online Shoppers compared to general Internet Users.

3. Methodology

The study utilizes a robust meta-analytic methodology, which is a highly effective statistical approach that allows the researchers to combine and synthesize data from multiple studies. By leveraging this methodology, the study provides in-depth insights into the impact of several factors, including trust, perceived risk, perceived security, and e-WOM, on the purchasing behavior of consumers in the e-commerce domain. The researchers meticulously consider the effect sizes of these factors and potential publication bias and conduct comprehensive moderator and subgroup analyses to ensure the study's validity and accuracy. Overall, this methodological choice enables the study to offer a comprehensive and nuanced understanding of the complex dynamics that govern e-commerce purchasing behavior.

3.1. Study selection

A multi-stage systematic literature review process was employed to identify relevant empirical studies. Using predefined keywords and their combinations, such as "Trust," "Risk," "Security," "e-WOM," "E-commerce and "Purchasing," The study searched documents through the Scopus database. After an initial screening based on titles and abstracts, the remaining articles underwent a full-text review to ensure they met the stringent inclusion criteria. These criteria included empirical research design, explicit examination of variables of interest, and the provision of sufficient statistical information to calculate effect sizes. Any study that failed to meet these criteria was excluded from the meta-analysis. Table 1 presents a summary of the procedures that were conducted in this study.

After identifying the studies that met the eligibility criteria, the researchers put in place a systematic data extraction protocol. This protocol was designed to retrieve and compile all the pertinent information from each study. The extracted information included details about the sample, such as the number of participants and their demographic characteristics. Additionally, the measures used in the study, such as assessment tools and questionnaires, were documented. The statistical methods employed by the researchers to analyze the data were also noted. Finally, the results that were relevant to the variables of interest, such as effect sizes, p-values, and confidence intervals, were extracted. By carefully extracting and documenting all the relevant data, the researchers could conduct a thorough analysis and draw meaningful conclusions. A summary and description of the literature used for analysis in this study are presented in Table 2.

3.2. Analysis: effect size, publication bias, moderator, subgroup

In each study, the effect size was computed using the correlation coefficient (r), which reflects the strength and direction of the association between the variables. These correlation coefficients were converted into Fisher's Z scores using the transformation approach proposed by Hedges and Olkin. These Z scores were used for analysis and then reconverted back into correlation coefficients for ease of interpretation. The study assessed the risk of publication bias using Rosenthal's fail-safe N. The fail-safe N estimates the number of unpublished studies with null findings that would be needed to render the observed effect insignificant. This statistic measures the robustness of the observed findings and the likelihood of their replication in future studies. The study performed subgroup meta-analyses to ascertain the moderating effects of Perceived Risk, Perceived Security, and e-WOM on the Trust-e-commerce purchasing behavior relationship. Here, studies were classified based on whether these potential moderators were explicitly examined. The analysis also distinguished between different groups of respondents: internet users versus online shoppers and participants from high-income countries versus low-income countries. Separate meta-analyses were performed for these subgroups to probe any potential differences in the effects of Trust on e-commerce purchasing decisions.

4. Results

4.1. Descriptive statistics

The data analyzed in this study were sourced from numerous studies investigating four variables in e-commerce: Trust, Perceived Risk, Perceived Security, and e-WOM. The studies varied widely in their sample size, ranging from a minimum of 123 participants to a maximum of 941. The total sample size across all studies was 32,658 participants. Table 3 shows the descriptive statistics of the variables used in this study.

Table 1
Procedures and description.

Step	Procedure	Description	Outcome
1	Searching Documents	Searching Document in Scopus Database using keywords:"Trust", "Risk", "Security", "E-WOM", and "E-commerce and "Purchasing",	696 Documents found
2	Content Analysis	Thoroughly identify Publication documents with quantitative approach, including correlation analysis in it.	85 Documents Found
3	Selecting Documents	Selecting documents with quantitative approach published between 2018 and 2023 (Last five years)	54 Final Documents used for analysis
4	Data Extraction	Collect relevant information from each study	Coefficient Correlation, Sample Size, Respondents, Country

Table 2
Sample of the study.

Study	Country	n	Respondent
Al-Adwan [68]	Jordan	418	Online Shopper
Al-Adwan, Alrousan [69]	Jordan	560	Online Shopper
Almajali [70]	Jordan	202	Internet user
Alotaibi, Alkhathlan [71]	Saudi Arabia	216	Internet user
Ann and Noor [72]	Malaysia	200	Internet user
Cabrera-Sánchez, Ramos-De-luna [73]	Spain	448	Internet user
Dong, Zhao [74]	China	726	Online Shopper
Gruntkowski and Martinez [75]	Germany	402	Internet user
Jamshida and Rajeswari [76]	India	290	Online Shopper
Kennedy, Marjerison [77]	China	691	Online Shopper
Kim [78]	Korea	417	Online Shopper
Lee, Ahn [79]	Korea	123	Internet user
Ma, Ruangkanjanases [80]	Taiwan	302	Online Shopper
Maia, Lunardi [81]	Brazil	208	Online Shopper
Masri, Ruangkanjanases [82]	Taiwan	293	Online Shopper
Tam, Pereira [83]	Portugal	251	Online Shopper
Zhang and Wang [84]	China	255	Internet user
Zhao, Fang [85]	China	236	Internet user
Tang, Rasool [86]	China	439	Online Shopper
Pappas [87]	Norway	182	Online Shopper
Chen, Hsiao [88]	Taiwan	242	Internet user
Wong and Haque [89]	Bangladesh	229	Online Shopper
Meilatinova [90]	Indonesia	421	Online Shopper
Dabbous, Aoun Barakat [91]	Lebanon	206	Internet user
Nisar, Hajli [92]	(UK)	380	Online Shopper
Hassan, Iqbal [93]	Pakistan	306	Online Shopper
Petcharat and Leelasantitham [94]	Thailand	384	Online Shopper
Trivedi and Yadav [95]	India	309	Internet user
Shareef, Dwivedi [96]	Bangladesh	200	Internet user
Le and Hoang [97]	Vietnam	594	Online shopper
Jasti and Syed [98]	India	206	Online shopper
Attar, Shanmugam [99]	Malaysia	107	Online shopper
Qin, Zhao [100]	China	276	Online shopper
Miao, Jalees [101]	Pakistan	415	Internet user
Li [102]	Taiwan	408	Online shopper
Riley and Klein [103]	USA	321	Internet user
Zhu, Kowatthanakul [104]	Thailand	401	Online shopper
Athapaththu and Kulathunga [105]	Sri Lanka	292	Internet user
Zhu, Mou [106]	China	473	Online shopper
Liu and Li [107]	China	359	Online shopper
Ngah, Azizan [108]	Malaysia	133	Online shopper
Siu and Ismail [109]	Malaysia	250	Internet user
Fu, Xu [110]	China	370	Internet user
Yadav and Mahara [111]	India	234	Internet user
Moriuchi and Takahashi [112]	Japan	264	Online shopper
Zhao, Wang [113]	China	183	Online shopper
Hossain, Hasan Mahmud [114]	Bangladesh	145	Online shopper
Wagner Mainardes, de Almeida [115]	Brazil	345	Online shopper
Wang and Herrando [116]	US	318	Internet user
White Baker, Hubona [117]	US	237	Online shopper
Sánchez-Torres, Arroyo-Cañada [118]	Colombia	941	Online shopper
Lin, Wang [119]	US	903	Online shopper
Shekhar and Jaidev [120]	India	267	Internet user
Leung and Ma [121]	Hongkong	610	Online shoppers

Table 3
Descriptive statistics of variable.

Variable	Number of study	Correlation Coefficient		Mean Correlation Coefficient	Std. Dev Correlation	Total Sample Size	Sample		Mean Sample	Std. Dev Sample
		Min	Max				Min	Max		
Trust	48	0.006	0.94	0.553	0.188	16,314	340	941	340	184
Perceived Risk	15	0.100	0.78	0.406	0.236	4,841	123	610	323	147
Perceived Security	12	0.130	0.74	0.465	0.192	4,695	200	941	391	207
e-WOM	17	0.190	0.70	0.474	0.162	6,808	123	941	400	225

Trust, the trust variable, was assessed in 48 studies, with a correlation coefficient ranging from 0.006 to 0.94. The mean correlation coefficient was 0.553, suggesting a moderate positive relationship, and the standard deviation of 0.188 indicates a degree of variability in this relationship. The total sample size for these studies was 16,314 participants, with individual study sizes ranging from 340 to 941 participants. The mean sample size was 340, with a standard deviation of 184. The perceived risk variable was assessed in 15 studies. The correlation coefficient for Perceived Risk ranged from 0.100 to 0.78, with a mean of 0.406 and a standard deviation of 0.236, demonstrating some variability in these results. A total of 4,841 participants were included in these studies, with sample sizes ranging from 123 to 610. The mean sample size was 323, with a standard deviation of 147. A total of 12 studies investigated the variable of Perceived Security. The correlation coefficient ranged from 0.130 to 0.74, with a mean of 0.465 and a standard deviation of 0.192, indicating moderate variability. These studies encompassed 4,695 participants, with individual sample sizes ranging from 200 to 941 participants. The mean sample size was 391, with a standard deviation of 207. Seventeen studies focused on the e-WOM variable. The correlation coefficient for these studies ranged from 0.190 to 0.70, with a mean of 0.474 and a standard deviation of 0.162, demonstrating relatively less variability than the other variables. The total sample size for these studies was 6,808 participants, with individual study sizes ranging from 123 to 941 participants. The mean sample size was 400, with a standard deviation of 225.

Descriptive statistics in Table 3 indicate varying degrees of correlation between Trust, Perceived Risk, Perceived Security, and e-WOM in e-commerce. Each variable is important in any comprehensive analysis of e-commerce behaviors and attitudes. The variations in correlation and sample sizes underline the complex and multifaceted nature of these interactions in the digital purchasing landscape. The results presented in Table 4 feature descriptive statistics from 54 studies categorized based on the economic status of the countries in which they were conducted and the profiles of the respondents participating in the studies.

Country's economic category, of the 54 studies included in this meta-analysis, 19 were conducted in countries categorized as low-income, comprising approximately 35.2 % of the total studies. Conversely, studies from high-income countries constituted the majority, with 35 studies representing around 64.8 % of the total. This shows a relatively unbalanced distribution of studies, needing the consideration of a wide range of socio-economic contexts in the study analysis of e-commerce behaviors and attitudes. The respondent profiles revealed a clear bifurcation between internet users and online shoppers. A total of 19 studies, approximately 35.2 %, had their respondent pool comprised entirely of general internet users. On the other hand, the remaining 35 studies, accounting for approximately 64.8 % of the total, specifically focused on online shoppers. This distribution highlights the emphasis placed on the experiences and perceptions of individuals who engage directly in online commerce activities while still considering the wider context of internet users. This diversification of sample selection, in terms of the economic category of the countries and the profile of the respondents, ensures a comprehensive view of the factors influencing trust, risk, security, and e-WOM perceptions in the digital age of purchasing. The insights derived from this meta-analytical perspective can enhance understanding of the current e-commerce landscape.

4.2. Effect size analysis

The study aimed to gain a deeper understanding of how Trust, Perceived Risk, Perceived Security, and e-WOM (electronic word of mouth) influence purchasing behavior in today's digital age. To achieve this, the study employed an effect size analysis, a statistical method that measures the strength and significance of each variable's impact. The analysis was conducted using a 95 % confidence interval (CI), which determined a range of values within which the true effect size is likely to fall. Additionally, the study calculated the standard error, z-score, and P-value to determine the statistical significance of the results. By utilizing these measures, the study was able to evaluate the impact of each variable on purchasing behavior quantitatively. Overall, this study provides valuable insights into the complex factors that influence consumer behavior in the digital age. The output of the statistical analysis measuring effect size is presented in Table 5.

The effect size for Trust was 0.670, indicating a strong positive impact on digital purchasing behavior. The standard error was 0.045. A z-score of 14.863 ($P < 0.001$) shows the effect is highly statistically significant. The 95 % CI ranged from 0.582 to 0.758, further confirming the reliability and significance of the effect of Trust on purchasing behavior in the digital realm. The effect size for Perceived Risk was 0.471, with a standard error of 0.083. A z-score of 5.673 ($P < 0.001$) shows that Perceived Risk also has a statistically significant effect on digital purchasing behavior, albeit weaker than Trust. The 95 % CI for this factor ranged from 0.308 to 0.634, again validating the significance of this effect. For Perceived Security, the effect size was 0.383, and the standard error was 0.179. The z-score for this factor was 2.143, with a P-value of 0.032, demonstrating a significant, yet comparatively weaker, impact on purchasing behavior. The 95 % CI for Perceived Security ranged from 0.033 to 0.733, implying a broader variability in the potential effect size. The effect size for e-WOM was 0.534, and the standard error was 0.052. With a z-score of 10.307 ($P < 0.001$), this result indicates a significant effect on digital purchasing behavior, with an effect size between Trust and Perceived Risk. The 95 % CI for this

Table 4
Subgroup descriptive statistics.

Category	Number of Study	Percentage
Country's Economic Category		
• Low income	19	35.2 %
• High income	35	64.8 %
Profile Respondents		
• Internet users	19	35.2 %
• Online shoppers	35	64.8 %

Table 5
Effect size.

Variable	Effect Size	Standard Error	z	P-Value	95 % CI	
					Lower	Upper
Trust	0.670	0.045	14.863	0.000	0.582	0.758
Perceived Risk	0.471	0.083	5.673	0.000	0.308	0.634
Perceived Security	0.383	0.179	2.143	0.032	0.033	0.733
e-WOM	0.534	0.052	10.307	0.000	0.433	0.636

factor ranged from 0.433 to 0.636, suggesting a relatively consistent impact. All factors (Trust, Perceived Risk, Perceived Security, and e-WOM) significantly affect digital purchasing behavior, with varying effect sizes. Trust had the strongest effect, followed by e-WOM, Perceived Risk, and Perceived Security.

4.3. Bias publication analysis

The publication bias analysis addresses the "file drawer problem," which refers to the bias introduced in the scientific literature when studies with non-significant results are less likely to be published. A fail-safe N statistic, calculated using the Rosenthal approach, helps to estimate the number of non-significant, unpublished studies that would need to exist (the so-called "file drawer" studies) to render the observed results insignificant. The output of the statistical analysis to test for publication bias is presented in Table 6.

Trust, with an impressively high fail-safe N of 121,878, implies that there would need to be 121,878 unpublished studies with non-significant results to nullify the significant effect of Trust observed in the current meta-analysis. The target significance level (0.050) is far above the observed significance level (0.000), reinforcing the robustness of these findings. Perceived Risk, the fail-safe N for Perceived Risk is 5,540. This indicates that 5,540 studies with non-significant results would need to be in the "file drawer" to negate the significance of our observed results. Like Trust, the observed significance level (0.000) is far below the target, further emphasizing the strength of these results. Perceived Security, the fail-safe N is 15. This is considerably lower than the fail-safe N values for the other factors, suggesting a higher susceptibility to the file drawer problem. Nevertheless, the observed significance level (0.007) is still below the target significance level, suggesting the observed results are likely reliable. The fail-safe N for e-WOM is 10,967, suggesting that nearly 11,000 unpublished studies with non-significant results would need to exist to counteract the significant results observed in this study. As with the other factors, the observed significance level (0.000) is well below the target, demonstrating the robustness of these findings. The fail-safe N calculations reveal that the observed significant effects of Trust, Perceived Risk, Perceived Security, and e-WOM on digital purchasing behavior are highly robust. Although Perceived Security shows a somewhat lower fail-safe N, all results demonstrate considerable resilience against the file drawer problem, indicating that the overall conclusions drawn in this study are likely to be reliable and robust.

4.4. Moderator analysis

Moderator analysis assesses whether certain third variables - in this case, Perceived Risk, Perceived Security, and e-WOM - impact the relationship between Trust and e-commerce purchasing decisions. It is based on the hypothesis that these variables moderate or change the correlation's strength or direction between Trust and e-commerce purchasing decisions. Table 7 presents the statistical output of the moderating role of perceived risk, perceived security, and e-WOM.

Perceived Risk was considered a potential moderator in 15 studies with a total sample size of 4,841. The correlation coefficient (r) of 0.744 indicates a strong positive relationship between Trust and e-commerce purchasing decisions when considering the moderating effect of Perceived Risk. However, a standard error of 0.362 and a P-value of 0.040 suggest that some uncertainty might influence this relationship. Nevertheless, the effect is statistically significant as the P-value is less than 0.05. The 95 % confidence interval (CI) for this effect ranges from 0.034 to 1.454, indicating a wide range of potential true effect sizes.

Perceived security, with respect to this potential moderator, 12 studies were analyzed with a total sample size of 4,695. The correlation coefficient of 0.355 suggests a moderate positive relationship between Trust and e-commerce purchasing decisions when Perceived Security is considered a moderator. However, the standard error of 0.384 and a P-value of 0.355 show that this relationship is not statistically significant at the 0.05 level. The 95 % CI ranges from -0.397 to 1.107 , suggesting high uncertainty around this effect size.

Table 6
Bias publication test output.

Variable	Fail-safe N	Target Significance	Observed Significance
Trust	121878.000	0.050	0.000
Perceived Risk	5540.000	0.050	0.000
Perceived Security	15.000	0.050	0.007
e-WOM	10967.000	0.050	0.000

Table 7
Moderating test output.

Moderator	Number of Study	Total Sample	r	Standard Error	P-Value	95 % CI	
						Lower	Upper
Perceived Risk	15	4,841	0.744	0.362	0.040	0.034	1.454
Perceived Security	12	4,695	0.355	0.384	0.355	-0.397	1.107
e-WOM	17	6,808	0.769	0.477	0.107	-0.165	1.703

The e-WOM variable was examined as a moderator in 17 studies with a sample of 6,808. A correlation coefficient of 0.769 suggests a strong positive relationship between Trust and e-commerce purchasing decisions moderated by e-WOM. However, a large standard error of 0.477 and a P-value of 0.107 indicate a lack of statistical significance at the conventional 0.05 level. The 95 % CI, ranging from -0.165 to 1.703, also reflects high uncertainty regarding this effect size.

Perceived Risk, Perceived Security, and e-WOM have different moderating effects on the relationship between Trust and e-commerce purchasing decisions. Perceived Risk shows a significant moderating effect, while the effects of Perceived Security and e-WOM are not statistically significant at the conventional level. Further studies are needed to validate and expand upon these findings.

4.5. Subgroup analysis

4.5.1. Internet users versus online shoppers

The meta-analysis study examined the relationship between trust and e-commerce purchasing decisions, specifically focusing on two groups: internet users and online shoppers. The analysis revealed significant heterogeneity among the studies for both groups. The Q statistic of 302.61 for internet users and a low p-value of 0.000 indicated substantial heterogeneity. The tau-squared value of 0.062 suggested moderate between-study variance. The high I^2 value of 94.44 % and H^2 value of 17.97 % further emphasized the presence of inconsistency and the considerable contribution of heterogeneity to the overall variance. The results of the statistical test that measures heterogeneity between Internet users and online shoppers are presented in Table 8.

Similarly, online shoppers exhibited significant heterogeneity, with a Q statistic of 1254.23, a low p-value of 0.000, and a tau-squared value of 0.114, indicating high between-study variance. The I^2 value of 97.68 % and the H^2 value of 43.10 % underscored the substantial inconsistency and significant contribution of heterogeneity to the overall variance in this group. The overall analysis, including both groups, demonstrated significant heterogeneity, with a Q statistic of 1585.30 and a low p-value of 0.000. The tau-squared value of 0.094 indicated moderate between-study variance. The I^2 value of 96.92 % and the H^2 value of 32.42 % reflected considerable inconsistency and a substantial contribution of heterogeneity to the total variance.

However, the test of group differences revealed no significant disparity between internet users and online shoppers regarding the relationship between trust and e-commerce purchasing decisions, as indicated by the non-significant Q_b statistic (0.59) and p-value (0.44).

4.5.2. High-income versus low-income countries

The heterogeneity summary reveals (Table 9) high variability within each group and across all studies. For the high-income group, a Cochrane's Q statistic of 1002.60, a Tau^2 of 0.087, an I^2 of 96.79 %, and an H^2 value of 31.11 all point to significant heterogeneity among the studies. Similarly, for the low-income group, the Q statistic is 581.76, Tau^2 is 0.108, I^2 is 97.15 %, and H^2 is 35.08, indicating substantial heterogeneity. When considering all studies collectively, the heterogeneity remains high with a Q statistic of 1585.30, Tau^2 of 0.094, I^2 of 96.92 %, and H^2 of 32.42.

These results suggest considerable variation among the studies, possibly due to differences in study designs, variations in how trust is measured, or other variables not considered in the studies. However, the test for group differences, with a Q_b value of 0.24 and a corresponding p-value of 0.624, suggests no significant difference in the true effect size between the high and low-income groups. This implies that the influence of trust on e-commerce purchasing decisions does not significantly differ between high-income and low-income countries.

The study's findings indicate that there is no substantial difference in the impact of trust on e-commerce purchasing decisions between high-income and low-income countries. However, to gain a more comprehensive understanding of these results, it is crucial to consider other factors such as the study context, effect size, confidence intervals, and more detailed information about individual studies. Examining these factors will provide a more nuanced analysis of the study's findings and their implications.

Table 8
Heterogeneity summary of Internet users versus Online Shoppers.

Group	df	Q	P > Q	Tau^2	% I^2	H^2
Internet users	17	302.61	0.000	0.062	94.44	17.97
Online Shoppers	29	1254.23	0.000	0.114	97.68	43.10
Overall	47	1585.30	0.000	0.094	96.92	32.42

Test of group differences: $Q_b = \chi^2(1) = 0.59$.

Prob > $Q_b = 0.44$.

Table 9
Heterogeneity summary of High versus Low-Income respondents.

Group	df	Q	P > Q	Tau ²	% I ²	H ²
High Income	28	1002.60	0.000	0.087	96.79	31.11
Low Income	18	581.76	0.000	0.108	97.15	35.08
Overall	47	1585.30	0.000	0.094	96.92	32.42

Test of group differences: $Q_b = \chi^2(1) = 0.24$.

Prob > $Q_b = 0.624$.

5. Discussion

5.1. Discussion on the direct effect

The finding in this study indicates that 'Trust' emerged as the most influential factor in e-commerce purchasing decisions, displaying the highest effect size. This underscores trust's central role in online transactions, where a lack of face-to-face interaction and the inherent uncertainty and perceived risk can deter consumers. Trust, in e-commerce, often refers to consumers' confidence in the online retailer's integrity and reliability. This encompasses various aspects, such as the belief that the retailer will deliver the promised product or service, adhere to fair business practices, respect customer information privacy, and provide effective recourse in case of problems [19]. The study's findings build on a substantial body of research highlighting trust as a critical determinant of online shopping behavior. Trust has been found to reduce perceived risk [21] and positively influence consumers' attitudes toward online shopping and their intention to purchase [19,39]. The results corroborate these studies, confirming the persistent importance of trust, even as the digital landscape continues to evolve. E-commerce platforms can build trust by ensuring product quality, providing excellent customer service, maintaining transparency in their operations and policies, and taking robust measures to ensure transaction security and data privacy. Displaying customer reviews and ratings, or "e-WOM," can also serve as a form of social proof, enhancing trust in the platform and its offerings.

Perceived Risk showed a substantial effect size, suggesting it is a significant factor in e-commerce purchasing decisions. Perceived Risk in this context can encompass a variety of potential fears or concerns that consumers may have, such as the risk of financial loss, privacy breaches, receiving counterfeit or low-quality products, or the inconvenience of returns in an online environment. The findings align with the broad body of research highlighting perceived risk's influence on online consumer behavior. According to the classic consumer behavior theory, consumers often weigh perceived benefits against perceived risks during decision-making [122]. In the e-commerce context, this risk-benefit analysis becomes even more critical due to the physical inability to inspect products, uncertainty about vendor reliability, and potential data security issues [59]. In numerous studies, perceived risk negatively impacts consumers' trust and purchase intention [21,39]. Perceived risks, particularly product performance and financial risks, were significant barriers to online shopping adoption [123]. The results in this study reinforce this narrative, emphasizing that e-commerce platforms must actively work to minimize perceived risk to boost customer trust and purchase intent.

Perceived Security was less influential in e-commerce purchasing decisions in this study than Trust, e-WOM, and Perceived Risk. This suggests that while consumers value security, their perception might be more nuanced and possibly influenced by other factors, such as trust and perceived risk. Perceived security refers to the degree to which a consumer believes an online transaction will be safe from threats, such as identity theft, credit card fraud, or data breaches. These concerns have been amplified by the increasing prevalence of cybercrime incidents reported in the media. The results in this study are consistent with existing literature that indicates a direct and significant relationship between perceived security and online shopping behavior [21,39]. Consumers are more likely to engage in online transactions when they perceive that the platform is secure and can protect their personal and financial information [124]. The fact that Perceived Security had the largest confidence interval in this study suggests a high degree of variability in this variable. This could be due to various reasons, such as different consumers' varying levels of understanding of digital security, divergent experiences with online shopping, or differing thresholds of what they consider 'secure.' This underscores the importance of e-commerce platforms to ensure security and communicate this effectively to their diverse customer base.

The substantial effect of e-WOM aligns with research suggesting its influential role in e-commerce. E-WOM significantly impacts consumers' purchase intentions [63], and the findings in this study bolster this assertion. This reiterates the necessity of e-commerce platforms to actively manage and encourage positive online reviews, as they hold substantial sway over potential customers. The findings in this study are consistent with previous studies that highlighted the role of e-WOM in shaping consumers' attitudes and intentions [62,63]. It's important to note that the power of e-WOM is a double-edged sword for e-commerce platforms. While positive reviews can enhance reputation and foster trust, negative reviews can quickly erode trust and dissuade potential customers. Hence, effective management of E-WOM is crucial, requiring strategies such as actively encouraging reviews, promptly responding to negative feedback, and ensuring the review process's integrity against manipulation.

Perceived Risk and Perceived Security, although demonstrated to have significant impacts, wielded a comparatively lesser influence on digital purchasing behavior than trust and e-WOM. This contrasts somewhat with existing literature, suggesting a higher significance for these variables [125]. Results in this study suggest that while Perceived Risk and Security are crucial, their impact may be mitigated by the overriding importance of Trust and robust cybersecurity measures. Despite the smaller effect sizes of Perceived Risk and Perceived Security, these variables play an influential role in shaping digital purchasing behavior. Consequently, e-commerce platforms should maintain their significance and work towards managing perceived risks and enhancing perceived security to instill

greater consumer confidence. Nevertheless, the slightly lower fail-safe N for Perceived Security identified in bias publication analysis suggests that more research needs to be conducted to solidify the understanding of this factor's role in the e-commerce context [126].

5.2. Discussion on the moderating effect

The finding in this study highlights that the relationship between trust and E-commerce purchasing decisions is significantly moderated by perceived risk. This affirms the influential role of trust in the online purchasing environment, particularly when consumers perceive a high degree of risk. The term perceived risk in online shopping often encompasses several factors, including financial risk, product performance risk, and personal information security risk [59]. One crucial aspect of perceived risk is the potential financial loss that consumers might encounter during online transactions. E-commerce inherently risks financial loss due to fraudulent transactions, non-delivery of products, or hidden costs. The finding implies that if customers trust the online platform, this perceived financial risk is reduced, thus facilitating a positive purchasing decision.

Product performance risk is another substantial factor in e-commerce. Owing to the nature of online shopping, customers need help to inspect or try out products before purchasing physically, increasing the uncertainty about the product's quality and performance [124]. Trust in the e-commerce platform can alleviate this concern, as it assures the consumer of its commitment to selling quality products. Lastly, personal information security risk involves potentially misusing personal and financial information shared online [127]. In an era where data breaches and identity theft are common, trust plays a pivotal role in assuring consumers about the safety and privacy of their personal information. However, it is crucial to note this study's findings relatively large standard error, suggesting considerable variability. This might be attributable to differences in individual risk tolerance, purchasing habits, and other demographic variables, underscoring the need for further research in more specific demographic groups.

This study found that perceived security is not significant in moderating between trust and E-commerce purchasing decisions. This could be interpreted as indicating that while perceived security is indeed related to trust and online purchasing behavior, it may not be as strong a determinant as perceived risk or e-WOM. Perceived security generally involves believing that an online platform provides a secure transaction environment, protecting consumers from potential cyber threats and data breaches [61]. In many models of online consumer behavior, perceived security has been considered a vital antecedent to trust [19,128]. However, findings in this study suggest that while perceived security matters, it may have less weight in influencing E-commerce purchasing decisions than we assume. One potential reason for this could be the evolving nature of E-commerce platforms and cybersecurity measures.

As E-commerce platforms increasingly adopt advanced encryption technologies, secure payment methods, and rigorous privacy policies, the standard level of transaction security might have improved universally, making it a less distinguishing factor in consumers' decision-making processes [129]. Another aspect worth considering is that while perceived security is crucial, consumers might need help understanding the technical aspects of online security. They may rely on cues such as website design, brand reputation, and third-party certifications to gauge security rather than understanding the underlying security protocols [130,131]. While the study suggests no significant moderation role of perceived security in the relationship between trust and E-commerce purchasing decisions, it does not negate the overall importance of security in building trust and facilitating online transactions. Rather, perceived security may be considered a prerequisite or baseline for online transactions. Other factors like perceived risk and e-WOM might provide more distinctive influences on purchasing decisions.

E-WOM refers to the electronic word-of-mouth sharing of product-related information through digital channels [63]. It has been identified as a potential influencer in the online purchasing decision-making process because consumers often turn to reviews and ratings from others to inform their decisions (Liu, 2003). However, the result of this study indicates that e-WOM doesn't significantly moderate the relationship between trust and e-commerce purchasing decisions. This could imply that despite the potentially informative role of e-WOM, consumers might still primarily base their e-commerce purchasing decisions on the level of trust they have towards the online seller or platform rather than the e-WOM. It might also suggest that while consumers appreciate and consume the information from e-WOM, this information doesn't necessarily influence their trust in the seller or platform. This could be due to e-WOM's perceived authenticity and credibility, as there are concerns about the possibility of manipulated or fake reviews online [132]. Still, this finding might not align with other studies that have found e-WOM to influence trust and online purchasing behavior significantly [133,134]. Thus, more research would be needed to reconcile these different results and perhaps consider the types of products or services being sold, the demographic profiles of the consumers, and the specifics of the e-commerce platforms in question.

5.3. Discussion on subgroup analysis

The results indicating no significant disparity between internet users and online shoppers regarding the trust and purchasing decision relationship offer fascinating insights. Trust influences how consumers evaluate an online merchant's credibility, willingness to take risks, and decision to purchase [39]. One could expect disparities in the perception of trust between internet users and online shoppers, given that the latter group has more direct experience in the e-commerce context, possibly having a higher level of trust in the digital platform. However, the study's findings suggest otherwise, that both groups perceive the relationship between trust and purchasing decisions similarly. This could suggest that the experience of shopping online does not significantly alter the perception of trust in e-commerce platforms, at least not to the point where it has a statistically significant impact on the decision to purchase. It might be that trust is now so fundamental and ubiquitous to all internet users, irrespective of their online shopping experiences.

Nevertheless, the current study's findings provide fertile ground for further exploration. Future research could delve deeper into understanding the variables that affect trust among internet users and online shoppers. Potential areas include investigating the impact of various trust-building mechanisms employed by e-commerce platforms and their influence on purchasing decisions across different

demographic groups. The findings align with a shift observed in consumer behavior over the past decade. As more consumers become digitally literate, they become more comfortable and trusting in online platforms, even for transactions [19,135]. This might explain why internet users and online shoppers have no significant difference in trust levels toward e-commerce platforms.

This study has identified no significant difference in the true effect size between the high and low-income groups regarding the relationship between trust and e-commerce purchasing decisions. Trust, as a variable, has long been established as an essential ingredient for successful e-commerce transactions [39]. Whether in the online platform, the seller, or the product, trust has been significantly associated with consumers' willingness to engage in online purchases [19]. Therefore, this study's affirmation that trust plays a significant role in e-commerce purchases across all income levels is an important consideration for online retailers. What is surprising and perhaps contrary to the initial hypothesis is that the level of income does not impact the relationship between trust and purchasing decisions. This suggests that irrespective of income levels, trust remains a universally significant variable.

Higher-income consumers were more likely to be influenced by trust due to their purchasing power and the higher risks associated with online purchases [136]. However, this study does not corroborate those findings. This could be because the development and widespread adoption of security protocols and user-friendly e-commerce platforms have made online transactions safer and more reliable [137]. Hence, lower-income consumers are equally concerned about trust in making e-commerce purchases. Alternatively, this might suggest that trust is a basic requirement for any consumer, regardless of income, before making an online purchase. The subgroup analysis provided further noteworthy insights, revealing that the influence of trust on digital purchasing behavior remained consistent across diverse user types and socioeconomic contexts. This finding indicates that the importance of trust is universal, transcending boundaries of user experience and national income levels. This aligns with research suggesting trust is a universally accepted driver of online purchasing behavior across different subgroups [138].

6. Conclusion

This study provides a comprehensive analysis of the factors that influence online purchasing behavior, focusing on four key factors: trust, perceived risk, perceived security, and e-WOM. The findings contribute to the expanding body of research in digital commerce by providing a deeper comprehension of how these factors interact and affect consumers' online shopping behaviors. The ongoing transformation of the digital landscape continues to redefine the parameters of consumer behavior. This study provides insights into this evolving dynamic, underscoring the multifaceted influences on digital purchasing decisions. The salient role of Trust, the nuanced effects of perceived risk, perceived security, and e-WOM paint a rich picture of the complex factors driving online purchasing behavior.

The study reaffirms the preeminent role of trust in e-commerce purchasing decisions. As such, fostering trust should be a key strategic focus for e-commerce platforms. Continued research on this critical factor can offer valuable insights to optimize trust-building efforts in the digital marketplace. Findings in this study underline the primacy of Trust in the e-commerce sphere, echoing the sentiments of a vast corpus of prior literature. This powerful influence of Trust on digital purchasing decisions suggests that businesses operating in the e-commerce domain must focus on strategies to foster and maintain consumer trust.

The significant role of Perceived Risk in this study underlines its importance in the e-commerce consumer decision-making process. Effective management of perceived risk is crucial for e-commerce platforms aiming to enhance customer trust and drive sales. The role of perceived risk in e-commerce is significant because it can influence consumer decision-making. When the perceived risk is high, it can deter online purchasing, limiting the sales volume for the e-commerce platform. Conversely, low perceived risk can encourage consumer trust and facilitate online purchasing, driving up sales for the e-commerce platform.

The study highlights the importance of perceived security in the context of e-commerce. Even though it might not be the most influential factor, it plays a significant role in shaping online purchasing decisions. It indicates the need for a relentless focus on securing online platforms to assuage consumer fears about potential threats. Therefore, ensuring and enhancing perceived security should remain a priority for e-commerce platforms, and more research is needed to understand this complex factor fully.

This study reaffirms the pivotal role of e-WOM in e-commerce, reflecting its power as a social influence and a vital source of information for consumers. Thus, E-commerce platforms should give e-WOM due consideration in their strategies, while further research is required to understand its complex dynamics fully. The study also suggests that further investigation into e-WOM's nuances is warranted. Future research could explore the differential effects of positive and negative e-WOM, the influence of reviewer credibility, and the impact of e-WOM across different product categories or cultures.

The insights derived from the moderator analysis contribute to the emerging narrative of how variables interact to shape digital purchasing behavior. While Perceived Risk showed significant moderation of the relationship between Trust and e-commerce purchasing, the roles of Perceived Security and e-WOM were less clear. This underlines the need for future research to deepen our understanding of these relationships, focusing on the multifaceted interactions among these variables. The moderation and subgroup analysis further refine our understanding of these influences, suggesting a multifaceted, interconnected web of factors. The lack of significant moderating effects of Perceived Security and e-WOM and the universal influence of Trust across diverse user categories and economic contexts emphasize the need for more detailed investigations.

A sophisticated understanding of these complex influences is crucial as we delve deeper into the digital age. The findings in this study offer a strong foundation for e-commerce businesses to enhance their strategies and for researchers to continue unraveling the intricate dynamics of digital purchasing behavior. Future research can extend this work by exploring the effects of demographic, cultural, and product-specific factors, further enriching our understanding of this crucial aspect of modern commerce. Ultimately, every insight brings us closer to a comprehensive understanding of the digital consumer, an increasingly paramount goal in our interconnected world.

7. Limitations and suggestions

7.1. Research limitations

The e-commerce industry is a complex web of interrelated factors that determine its success. User experience (UX) and user interface (UI) are key components of a successful e-commerce platform, as they directly affect customer satisfaction and loyalty. Social and cultural factors also play an important role, as consumers are influenced by their peers and the broader cultural context in which they live. Payment options and security are critical for building trust with customers and ensuring that transactions are secure. Finally, supply chain logistics are essential for ensuring that products are delivered on time and in good condition. This study focuses primarily on trust, risk, security, and electronic word of mouth (e-WOM), as they have been identified through an extensive literature review as having a direct and significant impact on consumer behavior and e-commerce transactions. These factors were chosen because they are critical determinants of e-commerce success and are interrelated, making it possible to examine the consumer decision-making process in online environments comprehensively.

It is crucial to understand the limitations of this study's focus. By concentrating on only four factors, the study may not provide a comprehensive understanding of other significant elements that can impact the online shopping experience, such as UX/UI. The user interface and experience can play a crucial role in shaping the customer's journey, influencing their satisfaction and loyalty towards the brand. Moreover, the cultural and social dimensions of e-commerce, which can vary significantly across regions and demographics, are not deeply explored in this study. Neglecting these aspects can result in overlooking how they can alter the effectiveness of online markets. While the issue of financial security is partly covered under the security dimension, it is essential to note that the evolving nature of payment options and the critical issue of financial security warrant a more detailed investigation. The centrality of these factors to consumer trust and transaction completion makes it imperative to explore them in detail. Lastly, it is crucial to note that supply chain and logistics are pivotal to the e-commerce experience. They can significantly impact delivery times, product availability, and customer satisfaction. However, it is important to understand that they fall outside the scope of this study.

Our research deliberately narrows its focus to explore the foundational elements of trust, risk, security, and e-WOM within the e-commerce industry. This approach aims to provide a deeper understanding of how these factors influence online purchasing behavior. However, it is important to note that this limited scope may not encompass all the factors affecting the e-commerce industry. To address this, future research could benefit from taking a broader approach and exploring a wider range of factors that contribute to the success and sustainability of e-commerce platforms. This would provide a more comprehensive and holistic view of the complexities involved in e-commerce and enhance the research's comprehensiveness and richness.

7.2. Suggestions for future research

The world of e-commerce is fiercely competitive, and businesses are always striving to improve their digital platforms to attract and retain customers. User experience (UX) and user interface (UI) are two critical elements that can make or break an e-commerce platform. By exploring the role of UX and UI in e-commerce through future research, we can gain a deeper understanding of how design intricacies influence consumer engagement, satisfaction, and loyalty. UX and UI are essential components of e-commerce platforms that enable users to navigate through the website seamlessly and complete their transactions with ease. The better the UX and UI, the more likely users are to engage with the platform and make a purchase. Therefore, it is crucial to understand the factors that facilitate positive user interactions and enhance conversion rates. Through dedicated studies on UX and UI, we can uncover the strategies that underpin successful e-commerce platforms. Intuitive design and seamless user experiences are critical factors that can significantly enhance consumer engagement and loyalty. By delving deeper into the intricacies of UX and UI, we can illuminate the best practices that businesses can implement to improve their e-commerce platforms and stay ahead in the fiercely competitive digital marketplace.

The study of the social and cultural effects of e-commerce is a multifaceted and intriguing field of research. It involves exploring the intricate ways in which societal norms and cultural values influence online shopping behaviors and preferences, as well as the crucial role that social media plays in shaping consumer perceptions. By analyzing the variations in e-commerce practices across different cultural contexts, we can gain a nuanced and comprehensive understanding of the complex dynamics of the digital marketplace on a global scale. Such research has the potential to provide insightful data into the adaptation of e-commerce strategies that cater to diverse cultural backgrounds, leading to a more effective and inclusive global market reach.

Electronic commerce, commonly known as e-commerce, has become an increasingly popular method of conducting business transactions in the modern world. As such, it is essential to investigate the various factors that influence the reliability and diversity of payment options, as well as transaction security. Further scholarly attention is required to delve into how the availability of different payment methods can influence consumer trust and decision-making processes, especially considering the swift evolution of digital payment technologies. Moreover, examining the effectiveness of security protocols in safeguarding consumer information can offer critical insights. By understanding this research area, it can be possible to bolster consumer confidence and ensure the security of online transactions, thereby supporting the sustained growth of e-commerce platforms.

The field of e-commerce presents a wide range of opportunities for research, with a particular focus on the operational aspects of supply chain management and logistics. Specifically, there is a need to examine how logistical efficiency and reliability impact consumer satisfaction and loyalty. Given the continued expansion of e-commerce, the pressure on supply chains and delivery systems is only expected to intensify. Therefore, in-depth research in this domain can help identify the operational challenges and opportunities within e-commerce and provide evidence-based strategies for optimizing logistics to meet consumer expectations and support the robust growth of online businesses.

Data availability statement

Data is available upon request.

CRediT authorship contribution statement

Sofik Handoyo: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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