International Journal of Electronic Commerce Studies
Vol. 14, No. 2, pp. 27-56, 2023
doi: 10.7903/ijecs.2181

# Electronic commerce: Overview of risk disturbing

Mounia Hafiani
National School of Applied Sciences,
Ibn Tofail University,
mounia.hafiani@uit.ac.ma

Laila El Abbadi
National School of Applied Sciences,
Ibn Tofail University,Kenitra, Morocco
laila.elabbadi@uit.ac.ma

## ABSTRACT

Electronic commerce is advancing quickly, which makes online transaction management very complex. The fact that e-commerce is a complicated network of linked transactions generates many risks. In this article, we identify, analyze, and discuss the key risks facing e-commerce based on an analysis of 80 papers. This evaluation allowed us to identify four primary risks: environmental risks, operational risks, perceived risks, and, finally, reverse logistics risks. The environmental risks are related to all extremely damaging actions, such as excessive fuel usage, CO2 emissions, and more packaging. Perceived risks are directly tied to the customer and can confuse the purchasing decision. Operational risk arises from the flow of e-commerce logistics. And finally, the risk of reverse logistics when a customer returns a defective product. For this reason, security measures need to optimize these risks, maintain service performance, satisfy customers and respect the sustainability of the environment.

**Keywords:** e-commerce risk, electronic commerce, environmental risk, operational risk, perceived risk

## 1. INTRODUCTION

The rapid development of the internet has resulted in significant growth in online sales, also known as e-commerce, e-business, electronic commerce, online shopping, or buying through the internet. There are various definitions of e-commerce in the literature. According to [1], there is no commonly accepted definition of e-commerce. E-commerce, for example, is described as the exchange of business data, the maintenance of business relationships, and the completion of commercial transactions [2]. Furthermore, [3] define e-commerce as a new business model that fulfills the needs of companies, merchants, and shoppers to reduce costs, improve the quality of products and services, and speed up service delivery. Also, [4] mentioned that “electronic commerce is a new concept that entered the business repertoire in the 1970s”. Finally, electronic commerce, also known as e-commerce, refers to any

business type or commercial transaction involving data transmission over the internet [5].

We can conclude that e-commerce is a brand-new concept of online shopping that fits the service and product needs of organizations, merchants, and purchasers. The expansion of e-commerce has been in the United States, which is the leading continent in electronic sales, as Japan, Europe, and Asia-Pacific region [6]. E-commerce consists of multiple chains and streams interacting with each other. These flows are subject to some limitations and obstacles that threaten the implementation of this e-commerce business. The risk concept has always been present in industrial activity. There are different definitions of the term "risk" in the literature. The Risk definition is a scenario or event in which something of human value (including persons) is at stake, and the future is uncertain [7]. Risk Management Vocabulary (ISO 2002), defines risk as a combination of the probability and extent of the impacts, and it is certainly comparable to expected harm [8]. The development and growth of the Internet world have made it possible to develop services for buying and selling products or services over the internet. For this, e-commerce lets to switch of business data without difficulty thru the internet facilitates transactions, and decreases costs. In addition, it improves the best of products or services and hurries up the speed of delivery. However, as in any other area, some risks can interfere with normal operations. This review of the literature's purpose is to identify some risks that become harmful to e-commerce.

## 2. RESEARCH METHODOLOGY

In this study, we chose to work with a literature review, because the literature review is characterized above all by a qualitative synthesis [9]. Meanwhile, [10] described literature reviews as a methodical, explicit, comprehensive, and repeatable way to identify, evaluate, and interpret existing original works created by researchers and scholars. [9] added that literature reviews make up the backbone of almost all academic papers. Several researchers have studied the risks of e-commerce and have identified different risks to measure and manage them. This research is based on a review of the literature of 80 articles published between 1996 and 2021. The choice of articles depends on the importance, that the author place on the topic of e-commerce risks. In this framework, research focuses on finding keywords in research areas, such as "e-commerce risk assessment", " electronic commerce risk" and "e-commerce risk assessment", used in various information sources such as journal articles, conferences, reports, and books. This research is conducted on the websites of the "databases" Google Scholar (www.scholar.google.com), (www.ieeexplore.org), Scopus (www.scopus.com), Elsevier (www.elsevier.com), Taylor and Francis Internet (www.tandfonline.com), Science Direct (www.sciencedirect.com ).

# 3. GENERAL RESULTS AND ANALYSIS :

In this study, we worked on 80 articles that dealt with the risks that the e-commerce sector faces.

## 3.1 Number of publications

Based on this research, the graph below (figure 1) depicts the evolution of research in the field of e-commerce risk and how it has progressed from 1996 to 2021.

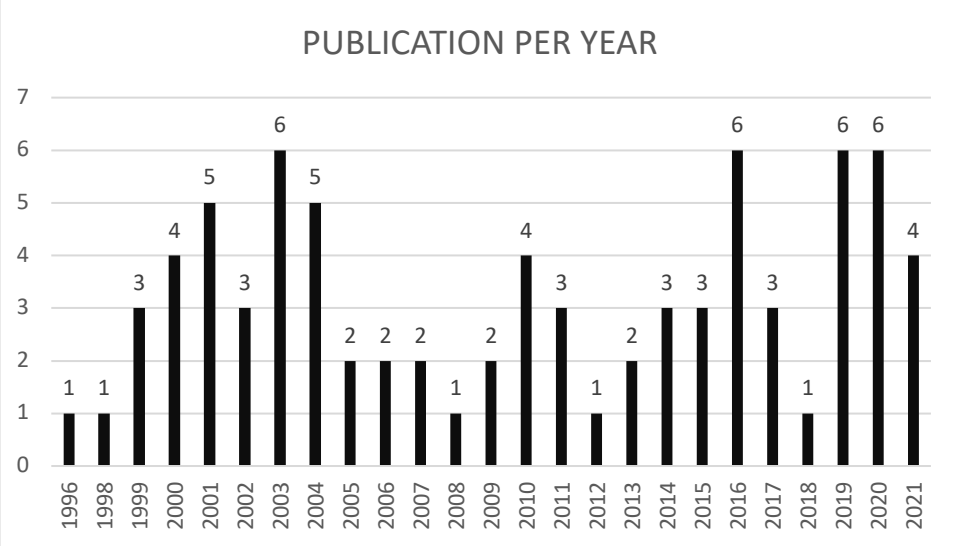


**Figure 1** Publication Per year

Visually, the diagram in Figure 1 is divided into three intervals in keeping with the distribution of publications in line with the year:

The first period is from **1996 to 2004**. The articles published during this period deal primarily with e-commerce-related environmental risks (28%), whose ecological influence is growing in importance, as indicated by an apparent peak in 2003 due to articles on environmental risks. Subsequent (35%) articles deal with perceived risk, and the rest of the publications deal with operational risk (17%), especially those related to supply chain risk. 15% of publications present other risks. Finally, some publications (4%) deal with reverse logistics risk.

The second period was from **2005 to 2015**. Throughout this period, the charts show that studies on e-commerce risk have decreased compared to the previous period, while publications dealing with environmental risk are number one (43%). The authors continue to address the perceived risks (13%). Publications dealing with operational risk are more or less stable (20%). On the other hand, no paper reverse logistics risks present 2%. Lastly, other risks appear at (22%)

The third period is from **2016 to 2021**. The total number of articles examined during this period is 26, and the number of articles on environmental risks (30%) decreased compared to the previous two periods. As a result, the auteurs' attention focused on publications dealing with supply chain-related operational risk (30%) related to the

supply chain justified by the peak of 2019. Finally, perceived risks increase than withinside the preceding periods (20%), and reverse logistic risks present (20%).

## 3.2 Document type

The documents examined in this study come from a variety of sources. The Diagram **Fig.2** depicts these various document types.

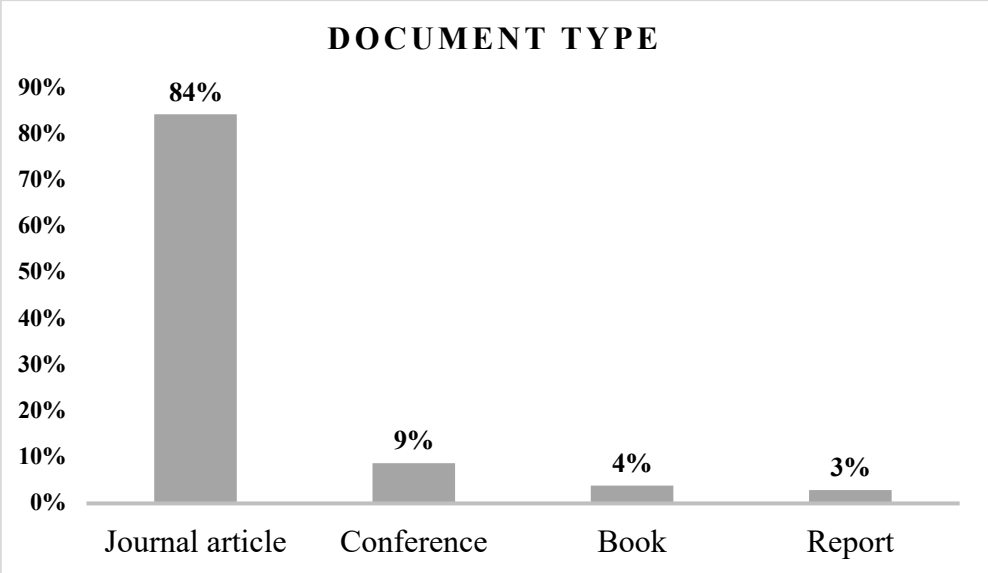


**Figure 2** Document type

This study is research from diverse sorts of publications. The majority of publications are journal articles (84%), mainly published as analysis and assessment (41%), study and case study (19%), reviews (16%), literature reviews (12%), surveys (6%), theory (2%), collaboration (1%) and experimental research (1%). Second, 9% of type of publications are conference papers, divided into conferences (45%), surveys (44%), and analyses (11%). The third place is occupied by other publications such as, excerpts from books (4%) in the form of study. Finally, the last type of publication is Reports (3%).

## 3.3 Paper type

This section describes the various sorts of academic publications that were used in this research. According to [11], scientific publications publish a variety of papers, which all extend to the scope of the journal. [11] cites five major academic papers categorized as follows:

- **"**Primary or original research Articles dealing with topics such as

Randomized controlled trial, Clinical trial, Before-and-after study, Cohort study, Case-control study, Cross-sectional survey, Diagnostic test assessment, Case report/case series, & Technical note.

- Secondary or review articles: Narrative review article, Systematic

review, Meta-analysis.

- Special articles: Letters/correspondence, Short communications,

Editorials/opinions, Commentaries, Pictorial essays, and other special categories.

- Tertiary literature: Textbooks, handbooks, manuals, Trade or

professional publication articles, Encyclopedias.

- Gray literature: Conference proceedings, posters, abstracts,

Government reports For-profit and nonprofit organization reports online forums Blogs, microblogs, tweet chats, and other forms of social media."

The diagram **Fig.3** shows the different document types used in this study, to see the methodology and direction of researchers conducting this of research type, to evaluate and analyze the risks in the e-commerce sector.

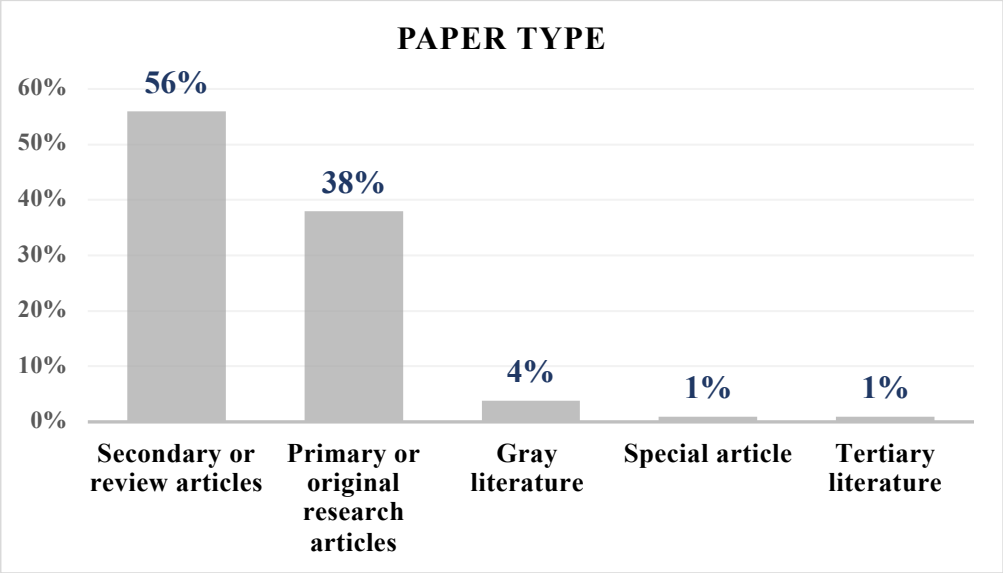


**Figure 3** Paper type

- **Secondary or review articles**: search found that the majority of

the publications on which this search was based on secondary articles or reviews, accounting for (56%) of all publications:

**Analysis**: analysis presented (**53%**), and it focused primarily on the analyze of e-commerce risks as operational risks, potential risks, and other articles on the e-commerce environmental risks such as carbon footprint, carbon emissions, and carbon impact. Finally, there are publications on e-commerce management and supply chain risk.

**Reviews**: The second type of publication is a review, which accounts for **27%** of all publications. The topics of the reviews include a review of reverse logistics, supply chain breakdown, risk management of logistic systems, as well as the environmental impact of electronic commerce.

**Literature review**: The final category, literature review, accounts for (**19%**) of all publications and focuses on environmental impacts of logistics, sustainability and supply chain management, state of the art in e-commerce foot printing, and supply chain disruption recovery. The literature review publications also begin with integrated e-commerce and consumer protection.

- **Primary or original research articles** accounted for 38% of the total, with a variety of studies such as:

**Survey:** A survey is the second category of Primary or original research article accounting **(24%)** written in the context of perceived risks in online shopping, and also the effects of home shopping on trucks and carbon emissions, and analysis of e-commerce risk.

**Report:** The third category reports account for **(8%),** and focus on the state of retailing online, product-level supply chain carbon audits, while report-type posts focus on online retail status, key indicators, and initiatives.

**Assessment and theoretical research**: The fourth category of the primary article is assessment and theoretical research accounting for **(5%**) of each other**:** depending on the title of the assessment articles, are dedicated to The Economic and Environmental Implications of Centralized Stock Keeping, Energy implications of online book retailing in the United States and Japan, Cross-border B2C e-commerce to China: An evaluation of different logistics solutions under uncertainty, Exploiting Big Data in Logistics Risk Assessment via Bayesian Nonparametric. Finally, theoretical research will discuss a conceptualization of e-risk perceptions and implications for small firms' active online internationalization.

**Experimental research**: The final category is experimental research, which accounts for **(3%)** of all publications, with a publication about A Software Framework for Non-Repudiation Service based on Adaptive Secure Methodology in Electronic Commerce.

- **Gray literature** presents (**4 %)** of all publications, principally

based on the conference and proceeding articles. The conference subjects are Dynamics in Logistics, Electronic Commerce Risk, and a Conceptual Framework for Mitigating the Risk in eCommerce Websites.

- **Special articles and Tertiary literature** present each other at

**(1%).** The special article is a dialogue about rethinking the role of consumers in supply chain management, and tertiary literature is a part of a book about Green logistics Improving the environmental sustainability of logistics.

## 4. DETAILED ANALYSIS AND DISCUSSIONS:

This study is based on a literature review analysis of 80 publications published in the period 1996-2021 in different journals. According to the analysis of the results obtained from this literature review, with the rapid evolution of e-commerce, we see that e-commerce faces risks and problems that disrupt the proper functioning of the field. Figure 4 shows the various risks the authors discussed in their respective studies.


**Figure 4** E-commerce Risks

This risk classification is determined by evidence culled from a variety of sources. These findings are based on a review of 80 papers that deal with the various risks associated with electronic commerce. Figure 4 presents four main risks mentioned in different publications. The first ranking concerns environmental risks, which present 35% of the total. The second ranking presents operational and perceived risks for (22%) of each other. The third family is reverse logistics presents a break to e-commerce with a rate of 9%. Finally, the last category is a different type presenting 12% of the totality. To these results; different types of risks are recognized when making a purchase decision, such as product risk, security risk, and privacy risk [12]. The perceived risk is of particular concern to online shoppers. Personal information provided online over the internet and the security of personal data may be used by hackers for illegal purposes. Second, because logistics is such a crucial component of electronic commerce, all risks related to logistics are automatically transferred to electronic commerce. A literature review of supply chain risk [13]**,** found that the supply chain risks described in this study, including operational and environmental risks, exist in the e-commerce sector. It is widely held that logistics systems are insecure in the global business era [14], and exposed to a wide range of challenges [15]. E-commerce can face logistics-related operational risks, such as supply and demand risks as well as reverse logistics risks. Third, e-commerce creates additional travel, packaging, and returns management that simplifies and minimizes consumer travel while undermining environmental sustainability.

## 4.1 Environmental risks

Due to the growing expansion of e-commerce, the environmental concerns linked with the e-commerce domain are increasing [16]. Environmental issues are growing [17], and the impact of B2C and e-commerce logistics operations, on the environmental sustainability of businesses in many industries is uncertain [18]. When it comes to environmental sustainability, the impact of B2C e-commerce supply chain operations on the environmental sustainability of businesses across industries is uncertain [12],[16]. In addition, the supply chain is a strong link for online business, and the field of supply chain management has an inherent connection to sustainability,

and it has been recognized that the concept of sustainability extends to both the operational drivers of profitability and their relationship to people and the environment in which we all live[19].[20] undertook a careful evaluation of the existing research on the ecological impacts of B2B and B2C e-commerce; among those implications, increase information technology usage increase, physical distribution, and additional packaging as mentioned [21]. A recent study by [22]focused on problems such as resource waste, environmental pollution, and reverse logistics problems. [23] cited Two conditions that significantly affect the environmental performance of B2C e-commerce are population density, which is related to consumer travel modes and distances, and the number of goods purchased in a single order.

Transport and carbon emissions: The environment is becoming increasingly important to governments, businesses, and other private entities worldwide. Organizations are beginning to appreciate the importance of transportation's environmental and social repercussions, such as noise pollution and traffic congestion, on other parties or society as a whole [24]. On the other hand, according to [25], the logistics system's most significant source of environmental risks is the transportation sector, and the choice of mode of transportation is a specific example of a choice that affects the environment. [18] generally believe that transportation has the greatest impact on durability. In general, express deliveries are frequently made by means of transportation, whose environmental pressure is higher than regular deliveries, so the environmental impact would be high [26]. In this regard, the delivery of the last kilometer is perceived as the most significant of transportation activities, as there is typically very little difference between the two options (i.e., online purchases compared to traditional purchases) for the majority of other transportation activities [27]. [28] concluded that last-mile delivery and return environmental effects warrant higher priority due to their rapid growth, and there is a complicated relationship between online purchases and the environmental impact of moving goods. The environmental sustainability of last-mile delivery primarily concerns the effects of road-borne merchandise transport, including air pollution (such as SOx, NOx, and CO), greenhouse gas emissions (such as CO2, CO2e, and CH4), noise pollution, and encroachments (resulting in fuel spills)[24]. Additionally, the most significant negative externalities associated with transportation include emissions (such as air and greenhouse gas (GES) pollution), noise, water pollution, traffic congestion, and accidents [24]. The analysis of the environmental effects of extended supply chains makes use of emission stress categories that are limited to air and water emissions [29]. Recent developments in stock distribution and control have made it possible for businesses to realize considerable cost savings. In general, these changes have not been examined in terms of how they may affect environmental quality, energy consumption, and sustainability [30]. The rapid growth of online shopping and home delivery has contributed to the recent increase in the use of trucks, which use more fuel and emit more emissions per ton of transported goods than other types of vehicles [31]. The CO2 emissions level of the last mile in e-commerce, which is considered "very high," is likely the most contentious of the environmental effects studied [32]. Emissions are regarded by [17], as a frequently recommended performance indicator

of logistics systems' environmental performance. Some online purchase areas compare more favorably to traditional retail sales, such as the book and DVD industries. Due in part to unsold merchandise, CO2 emissions from traditional retail are higher than in the case of online buying [23]. Faster deliveries make it more difficult for carriers to efficiently aggregate supplies, forcing them to make mostly empty trips, which increases CO2 emissions. Additionally, deliveries to homes are thought to have greater connected CO2 emissions [33].On the other hand, [20] focused on the carbon footprint of electronic commerce and looked at several industries. Consumer trips significantly increase the environmental footprint, according to numerous types of research on the effects of retailing on the environment. Consumer travel may use more energy than the total amount used to carry goods from the factory to the store, depending on the mode of transportation, the distance traveled, and the number of products in the shopping basket [34]. Moreover, energy consumption, mileage, gas emissions, and waste creation are the four main categories of metrics used to assess the effects of e-environmental commerce, according to [26]. Along with CO2 emissions, it has negative effects on the environment [35],20,[32],[36], and it has a high carbon footprint (e-commerce) [20]. Another sort of emission is continuous travel and related greenhouse gas (GHG) emissions, the significance of which varies by industry sector. These emissions come from unattended (or failed) supply [37] and returns from customers' processing [38].

Packaging: Beyond the effects of electronic commerce on conventional transportation, the packaging of delivered goods hurts environmental sustainability, particularly plastic waste and unsigned packaging [39]. Additionally [28] defined the four categories of distribution network design, transportation planning and management, packaging, and warehousing as the primary areas in e-commerce logistics operations that have an impact on the environment. The product packaging represents additional consumption on the part of the retailers, which has an impact on environmental sustainability [39]. Due to the individual packaging needed to send some products directly to customers [40],[41], and the additional packaging needed to deliver these items via express mail, online B2C business is typically thought to hurt the environment [21]. On the other hand, according to [23], managing client returns and small-lot shipments hurts the environment since it necessitates additional dumping and more involved collection and packaging processes. Due to the constrained amount of packaging used, the effect of customers using shopping bags for provisions in the context of traditional purchases is typically less severe [41].

Last-mile deliveries**:** E-commerce choices solve a big problem for online shoppers. E-commerce allows customers to meet their needs, especially with the courier, especially last-mile delivery. Given the significant increase in the number of last-mile deliveries and the number of services offered by customers, shopping will be easier, and you will be able to return if you are dissatisfied. And from the other hand, the increasing amount of last-mile deliveries causes more traffic jams, collisions, and longer long queues in public transit [42], transportation noise in residential areas, and illegally parked practices [43], which has a significant impact on public transportation and shows a negative social effect on the society as a whole. **Table 1** shows the publications presenting the e-commerce environmental risks.

**Table 1** Environmental E-commerce risk

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Emissions | [20] | The environmental implications of electronic commerce: A critical review and framework for future investigation | Management of Environmental Quality: An International Journal |
| | [17] | The environmental impact of changing logistics structures | The International Journal of Logistics Management |
| | [35] | 50th Anniversary Invited Article—City Logistics: Challenges and Opportunities | Transportation Science |
| | [32] | Carbon emissions of retail channels: the limits of available policy instruments to achieve absolute reductions | Journal of Cleaner Production |
| | [44] | Green management practices and firm performance: A case of container terminal operations | Resources, Conservation and Recycling |
| | [31] | Vans and the Economy | Advanced Engineering Informatics |
| | [30] | The Economic and Environmental Implications of Centralized Stock Keeping. | Journal of Industrial Ecology |
| | [37] | Transport impacts of local collection/delivery points. | International Journal of Logistics Research and Applications. |
| | [28] | Environmental Impact of Last Mile Deliveries and Returns in Fashion E-Commerce: A Cross-Case Analysis of Six Retailers. | 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM). |
| | [45] | Financing and carbon emission reduction strategies of capital-constrained manufacturers in E-commerce supply chains. | International Journal of Production Economics. |
| | [46] | Effects of e-commerce on urban distribution and the environment. | Journal de la société d'Asie orientale pour les transports |
| | [38] | Issues in emerging home delivery operations | DOCUMENT : University of California, Transportation Center, Los Angeles, CA |
| Energy consumption | [30] | The Economic and Environmental Implications of Centralized Stock Keeping | Journal of Industrial Ecology |
| | [44] | Green management practices and firm performance: A case of container terminal operations | Resources, Conservation and Recycling |

**Table 1** Environmental E-commerce risk

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Environmental Sustainability | [17] | The environmental impact of changing logistics structures | The International Journal of Logistics Management |
| | [20] | The environmental implications of electronic commerce: A critical review and framework for future investigation | Management of Environmental Quality: An International Journal |
| | [22] | To study game coordination mechanism for closed-loop supply chain in rural e-commerce | Journal of Physics: Conference Series |
| | [12] | Perceived risk, the Internet shopping experience and online purchasing behavior: A New Zealand perspective | Journal of Global Information Management (JGIM) |
| | [47] | Product-level carbon auditing of supply chains: Environmental imperative or wasteful distraction? | International Journal of Physical Distribution & Logistics Management |
| | [16] | The state of retailing online 2013: key metrics and initiatives | Forrester. |
| | [28] | Impact environnemental des livraisons et des retours du dernier kilomètre dans le commerce électronique de mode : une analyse de cas croisés de six détaillants. | 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM) |
| | [19] | Exploring the integration of sustainability and supply chain management: Current state and opportunities for future inquiry | International Journal of Physical Distribution & Logistics Management |
| | [18] | Comparative analysis of the carbon footprints of conventional and online retailing: A “last mile” perspective | International Journal of Physical Distribution & Logistics Management |
| | [1] | Potential risks to e-commerce development using exploratory factor analysis | International Journal of Services Technology and Management |
| Last mile delivery | [42] | Impacts of home shopping on vehicle operations and greenhouse gas emissions: multi-year regional study | International Journal of Sustainable Development & World Ecology |
| | [24] | A selected review on the negative externalities of the freight transportation: Modeling and pricing | Transportation Research Part E: Logistics and Transportation Review |

**Table 1** Environmental E-commerce risk

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Packaging | [28] | Environmental Impact of Last Mile Deliveries and Returns in Fashion E-Commerce: A Cross-Case Analysis of Six Retailers | 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM) |
| | [39] | Dynamics in Logistics: Proceedings of the 7th International Conference LDIC 2020, Bremen, Germany | Springer International Publishing/ BOOK |
| | [48] | Energy use in sales and distribution via e-commerce and conventional retail: A case study of the Japanese book sector | Journal of Industrial Ecology |
| | [40] | The environmental impact of changing logistics structures | The International Journal of Life Cycle Assessment |
| | [41] | A comparative analysis of carbon emissions from online retailing of fast moving consumer goods | Journal of Cleaner Production |
| Resource | [1] | Potential risks to e-commerce development using exploratory factor analysis | International Journal of Services Technology and Management |
| | [22] | To study game coordination mechanism for closed-loop supply chain in rural e-commerce | Journal of Physics: Conference Series |
| Reverse logistic<br>Small deliveries | [23] | Energy implications of online book retailing in the United States and Japan | Environmental Impact Assessment Review |
| Transport | [28] | Environmental Impact of Last Mile Deliveries and Returns in Fashion E-Commerce: A Cross-Case Analysis of Six Retailers | 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM) |
| | [48] | Energy use in sales and distribution via e-commerce and conventional retail: A case study of the Japanese book sector | Journal of Industrial Ecology |
| | [31] | Vans and the Economy | Advanced Engineering Informatics |
| | [17] | The environmental impact of changing logistics structures | The International Journal of Logistics Management |
| | [46] | Effects of e-commerce on urban distribution and the environment | Journal de la société d'Asie orientale pour les transports |
| | [49] | Setting targets for reducing carbon emissions from logistics: current practice and guiding principles | Carbon Management |

## 4.2 Perceived risks

Many studies focus on perceived risks. These risks affect consumer behavior, especially in e-commerce transactions. These are the different types of risks recognized in online purchasing decisions, such as product risk, security risk, and privacy risk. Previous research has found a link between risk awareness of new shopping channels and purchasing decisions through these channels [50]. Consumers perceive risk in the majority of purchase decisions, but out-of-store purchases have a higher perceived risk. In addition, consumers consider buying online over the Internet dangerous, since it is a new form of information technology tied to direct marketing [51]. Also, [51] discovered that risk-averse customers are less inclined to shop online. According to [52], consumers frequently rely on the judgment of merchandise buyers of a store with a good reputation when they have no other information about a product and assume that they have chosen products carefully for resale. Consumer risk affects perceptions about online shopping, but not the aim of online shopping, according to [53]. A detailed literature review of perceived risk is shown in **Table 2**.

Privacy and security risk**:** Security risks are arising as a result of E-commerce virtuality and the Internet's accessibility, and they are now preventing further E-Commerce development [54]. The highest risk to electronic commerce is likely the protection of data. Market locations are frequently the scene of so many infractions that it frequently seems as though everyone is engaging in theft, making it a real challenge to ensure that your store is secure and safe [55]. On the other hand, [56] asked two questions about privacy and security in e-commerce. The first question is about Privacy - Is the data of registered users online secure? The second question is about security - Are online transactions secure? [56] asks these questions because hackers are constantly on the move with new tactics as well as new scams that result in more infections over the long term. The evolution of network security threats on the Internet requires constant help. On the other hand, e-commerce enterprises have sensitive information about their consumers, such as their contact details and delivery address. This data must be safeguarded against unauthorized users and misuse [57, 58,12].Aside from issues concerning online transaction security, the reliability of the Internet also appears to be linked to consumer privacy concerns. These include the unauthorized acquisition of personal information by businesses while using the Internet or the disclosure of personal information gathered by businesses to third parties [6, 59, 61]. Computer viruses and hackers are perpetually attempting to hack web firms, and steal customers' data and financial information [62].

The computer system is a crucial business enabler in e-commerce since it is directly visible to the client. The system must build trust to fulfill the enabling role, and [63] contends that security is a crucial component of building trust. The final user and business units interacting with customers are a valuable source of security requirements due to the visibility of security-related requirements [64].

E-commerce systems are less secure than traditional types of businesses. To respond to the explosive expansion of e-commerce via the Internet, it is necessary thoroughly address e-commerce security issues [65]. A study in South Africa [66] revealed that e-commerce has not yet fully solved the security and trust difficulties that currently

affect online commerce, along with the doubts that currently affect purchasers and users in South Africa. Also, this analysis of perceived risks showed that financial and data corruption impact consumers' decisions to buy or not buy online goods or services [66].

Product risk**:** Four risk factors for online purchases have been identified [67]: technology, seller, consumer, and product. This research enabled the identification of numerous product risk definitions. According to [68] a product's risk is determined by its price and degree of ambiguity. Additionally, the term "product risk" refers to the possibility of making a poor purchase decision [12]. In addition, the risk associated with a product includes the possibility of making a poor economic decision due to an inability to evaluate costs, the impossibility of returning goods, and the possibility of not receiving a paid item [53 , 69]. Also known as, the degree to which people believe they will suffer losses due to the pressure of pairings if they make purchases on the internet is known as the consumer risk [67]. Another factor to take into account is the product's performance, which is related to the risk, that a product won't function as intended [50, 53, 69]. This is partially due to the inability to inspect the products before purchase [51]. According to [50], the possibility of online shopping declines as the product's risk increases. While there are four other types of risk (time risk, supplier risk, security risk, personal information risk, and performance risk), price comparison risk is more important in traditional purchasing. Therefore, the online environment presents a higher level of risk for these four types of risk than the traditional shopping environment [70]. Last but not least, [66] adds that there are still additional risks, such as not receiving the products or services that were ordered online, purchasing phony goods online, finding a deal, and some other issues. Table 2 shows the publications presenting the perceived risks.

**Table 2** E-commerce Perceived risk

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Perceived risk | [51] | Strategies for reducing consumers' risk aversion in Internet shopping | Journal of consumer marketing |
| | [53] | Consumer reactions to electronic shopping on the World Wide Web | International Journal of electronic commerce |
| | [71] | Internet marketing. | New York: John Wiley & Sons. |
| | [52] | Consumer Behavior (eight edit) | Document: New Jersey: Pearson Education |

**Table 2** E-commerce Perceived risk

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Privacy & Security risk | [12] | Perceived risk, the Internet shopping experience and online purchasing behavior: A New Zealand perspective | Journal of Global Information Management (JGIM) |
| | [54] | From risk analysis to security requirements | Computers & Security |
| | [62] | Analysis of e-commerce risk typologies | Colloquium-journal |
| | [66] | A Risk Analysis of E-Commerce: A Case of South African Online Shopping Space | 2019 Systems and Information Engineering Design Symposium (SIEDS) |
| | [56] | A Conceptual Framework for Mitigating the Risk in eCommerce Websites | 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO) |
| | [65] | A Software Framework for Non-Repudiation Service based on Adaptive~Secure Methodology in Electronic Commerce | Information Systems Frontiers |
| | [57] | Consumer Perceptions of Privacy and Security Risks for Online Shopping | Journal of Consumer Affairs |
| | [64] | Holistic security requirement engineering for electronic commerce | Computers & Security |
| | [63] | Trust in cyberspace | Book |
| Privacy and security risks | [61] | Consumer privacy concerns about Internet marketing. | Communication of the ACM |
| | [55] | E-Commerce and Consumer Protection in India: The Emerging Trend | Journal of Business Ethics |
| | [60] | Building consumer trust online | Communications of the ACM |
| | [58] | Ripple effect in the supply chain: An analysis and recent literature. | International Journal of Production Research, |
| | [59] | Internet marketing. | New York: John Wiley & Sons. |
| | [6] | Influences on the intent to make Internet purchase | Internet research. |
| Financial risk | [66] | A Risk Analysis of E-Commerce: A Case of South African Online Shopping Space | 2019 Systems and Information Engineering Design Symposium (SIEDS) |

**Table 2** E-commerce Perceived risk

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Product risk | [12] | Perceived risk, the Internet shopping experience and online purchasing behavior: A New Zealand perspective | Journal of Global Information Management (JGIM) |
| | [51] | Strategies for reducing consumers' risk aversion in Internet shopping | Journal of consumer marketing |
| | [68] | Customer expectations in online auction environments: An exploratory study of customer feedback and risk | Journal of Operations Management |
| | [67] | Consumers' perceived risk: sources versus consequences | Electronic commerce research and applications |
| | [66] | A Risk Analysis of E-Commerce: A Case of South African Online Shopping Space | 2019 Systems and Information Engineering Design Symposium (SIEDS) |
| | [69] | Print and Internet catalog shopping: Assessing attitudes and intentions. | Internet Research: Electronic Networking Applications and Policy |
| | [53] | Consumer reactions to electronic shopping on the World Wide Web | International Journal of electronic commerce |
| | [50] | On risk, convenience, and Internet shopping behavior | Communications of the ACM |
| | [70] | Clickable World Wide Web banner ads and content sites | Journal of Interactive Marketing |
| Consumer risk | [67] | Consumers' perceived risk: sources versus consequences | Electronic commerce research and applications |

## 4.3 Operational Risks

Logistics success is essential to e-commerce as e-commerce is an area based on delivery through a defined logistics network. This explains why the risks to which logistics are exposed automatically affect e-commerce activity. These are risks that are directly tied to the supply chain and arise at the supply and demand level. Of those discussed in this study, operational risk accounts for 27,9%. In the literature, [72] pointed out the types of e-commerce risks that can pose to businesses, including operational and technical risks. Hence, operational risk mainly refers to the risk from supply-demand uncertainty, operator mistakes, and incidents that can reduce levels of service or impede normal operation [73]. In addition, [74] define operational risks as the failure of operations, insufficient manufacturing or processing capability, excessive levels of process variance, changes in technology, and changes in operating exposure. According to a [75] study, demand and supply planning and integration risks, risks associated with inventory and customer service, and satisfaction - Risks to the availability and integrity of information are the operational risks deemed to be the most significant in a supply chain. According to [76], in a virtual business, the

identification of operational risks as technological reliability issues or logistical inefficiencies that have an immediate impact on the company's daily commercial operations is what leads to deviations from financial goals in international operations. Among the operational risks affecting e-commerce, supply risk is considered by different researchers in different articles. According to [77], define supply risk as "the probability of an incident occurring related to incoming supply that may result in vendor(s) or supply market failures, resulting in the focal firm's inability to meet customer demand within projected prices, or causing risk to client health and security ". Different researchers have identified different types of supply risks, the following summarizes the different supply risks:

The Accidents during delivery; would result in a significant drop in performance and significant losses [78].

Demand and supply planning and integrations risk: when demand increases abnormally, the forecasted supply may not be able to meet additional demand, resulting in lower sales and lower customer satisfaction. B2C e-commerce has lower customer switching costs [79].

Supply interruption risk: when an e-commerce business relies on inventory, then local or worldwide catastrophes such as fires, floods, cyclones, or economic decline might cause product supply to be disrupted. [80, 81].

Transport risks in air cargo logistics: defined as the difference between actual and planned arrival times [82].

Regulatory and compliance risks: Cross-border e-commerce is subject to FDI legislation and restrictions. Labeling and packaging are governed by municipal regulations [75].

Vendor quality risk: It consists of four elements dealing with the lack of expertise and experience of the supplier, the lockdown situation, the supplier offering outdated technology expertise, and the supplier providing poor service, all of which are related to the supplier's quality during the outsourcing of e-commerce activities, [1]. Technology, vendor, consumer, and product are the four risk factors outlined by [67] for e-commerce. Price comparison risk is higher in a typical auction, according to the risk classification [71] despite the presence of four other types of risk (time risk, vendor risk, security risk, privacy risk, and performance risk).

Uncertainties on supply: Certain unpredictable catastrophes, such as strong rains, floods, fires, earthquakes, labor strikes, and other disruptions, can disrupt a supply chain's operation and put the company's ability to respond to the test [83].

Demand risk is a supply chain operational risk. It is also considered an e-commerce risk. [84] defined demand risk as potential discrepancies between planned and actual demand. Hence [85] adds that demand risk is any risk related to the logistical flow outbound, and product demand, due to short product life cycles, seasonality, trend fluctuations, or new product introductions [86].On the alternative hand, [74], upload every other risk about the demand as demand uncertainty. The uncertainty disturbs also the cost factors as cited [87]. Moreover, [79] append the demand planning and

integrations risk as a kind of risk. At the last, demand fluctuation is another risk that disturbs the supply chain [88]. According to [78], uncertainty in demand and supply, mistakes made during warehousing operations, and delivery accidents would result in a significant decline in performance and major losses. Disasters can harm E-commerce logistics infrastructure, cause substantial delays in the delivery of goods, and serious overstock at remote distribution hubs. A recent example of this was Typhoon Mangkhut in 2018. E-commerce logistic risk: According to [62], fraud risks, such as identity theft, the loss of personal data related to payment systems, and third-party fraud risks in the supply and logistics industries, such as fraud, corruption, etc., have started to harm online retail businesses. The summary of the literature review of e-commerce operational risk is shown in **Table 3.**

**Table 3:** E-commerce Operational risks

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Operational risk | [73] | Risk management of logistics systems | Transportation Research Part E: Logistics and Transportation Review |
| | [72] | Electronic Commerce Risk: The Role For Standards | Proceedings of the Twelfth Australasian Conference on Information Systems |
| | [74] | Global supply chain risk management | Journal of business logistics |
| | [76] | A conceptualization of e-risk perceptions and implications for small firm active online internationalization | International Business Review |
| | [75] | Developing a Resilient Supply Chain | Procedia - Social and Behavioral Sciences |
| Demand risk | [79] | Managing risk for e-commerce supply chains: an empirical study | IFAC-PapersOnLine |
| | [84] | Minimization of supply chain cost with embedded risk using computational intelligence approaches | International Journal of Production Research |
| | [85] | A conceptual framework of vulnerability in firms' inbound and outbound logistics flows | International Journal of Physical Distribution & Logistics Management |
| | [86] | Learning from Toys: Lessons in Managing Supply Chain Risk from the Toy Industry | California Management Review |
| | [87] | Cross-border B2C e-commerce to China: An evaluation of different logistics solutions under uncertainty | International Journal of Physical Distribution & Logistics Management |

**Table 3:** E-commerce Operational risks

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Demand risk | [78] | Data-driven operational risk analysis in E-Commerce Logistics | Advanced Engineering Informatics |
| | [74] | Global supply chain risk management | Journal of business logistics |
| | [88] | Risk management in the supply chain: characterization and empirical analysis | Journal of Applied Business Research (JABR) |
| E-commerce logistic risks | [62] | Analysis of e-commerce risk typologies | Colloquium-journal |
| Supply risk | [77] | An analysis of supply risk assessment techniques | International Journal of Physical Distribution & Logistics Management |
| | [79] | Managing risk for e-commerce supply chains: an empirical study | IFAC-PapersOnLine |
| | [75] | Developing a Resilient Supply Chain | Procedia - Social and Behavioral Sciences |
| | [73] | Risk management of logistics systems. | Transportation Research Part E: Logistics and Transportation Review |
| | [80] | Supply-chain breakdown | MIT Sloan management review |
| | [83] | Risk in supply networks | Journal of Purchasing and Supply management |
| | [78] | Data-driven operational risk analysis in E-Commerce Logistics | Advanced Engineering Informatics |
| | [81] | Literature review on disruption recovery in the supply chain. | International Journal of Production Research |
| | [82] | Exploiting Big Data in Logistics Risk Assessment via Bayesian Nonparametrics | Operations Research |
| | [71] | Internet marketing. | New York: John Wiley & Sons. |
| | [67] | Consumers' perceived risk: sources versus consequences | Electronic commerce research and applications |
| | [1] | Potential risks to e-commerce development using exploratory factor analysis | International Journal of Services Technology and Management |

## 4.4 Reverse logistics

Reverse logistics is a strategy for attracting e-commerce customers, and it is required to serve and meet the needs of goods that are not qualitatively or quantitatively appropriate.[38] define reverse logistics deals with managing the movement of goods back to manufacturers, distributors, and retailers because they are the wrong size, broken, obsolete, or not ordered. As noted, [89]: In e-commerce supply chains, reverse logistics (RL) is imperative due to multiple factors such as returns, non-deliverable and damaged goods, exchanges, and environmental issues. The American Executive Board of Reverse Logistics defines reverse logistics as the process of planning, implementing, and controlling the efficient and cost-effective flow of raw materials, inventory, finished goods, and related information from the point of consumption to the point of origin, Reclaim value or dispose of properly [90].On the other hand, reverse logistics contains all management-related activities, reduction, treatment, and disposal of wastes (hazardous and non-hazardous) at various stages of the product's life cycle, including production and packaging, use phase, and reverse distribution process [91, 92]. In other words, reverse logistics is the practice of moving items from their regular final destination to restore their value or properly dispose of them [92]. In this sense, Customers are more likely to shop and purchase when a company offers free returns [28, 93]. Reverse logistics thus creates additional challenges for retailers as well as additional energy consumption, packaging, and transportation. This has an environmental impact along with energy consumption and CO2 emissions, which in this case can be attributed to the e-commerce risk grid in terms of environmental impact. Additionally to environmental impact, additional costs associated with adopting reverse logistics, as described in [94]'s research, in which they proposed a planning method for optimizing carbon taxes, transportation costs, processing costs, and information costs for inverse logistics. **Table 4** shows the publications presenting the e-commerce reverse logistic risks.

**Table 4** E-commerce and the reverse logistic risks

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Reverse logistic | [92] | An examination of reverse logistics practices | Journal of business logistics |
| | [93] | The effect of return policy leniency on consumer purchase and return decisions: A meta-analytic review | Journal of Retailing |
| | [28] | Environmental Impact of Last Mile Deliveries and Returns in Fashion E-Commerce: A Cross-Case Analysis of Six Retailers | 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM) |
| | [95] | A review of reverse logistics and closed-loop supply chains: A Journal of Cleaner Production focus | Journal of Cleaner Production |

**Table 4** E-commerce and the reverse logistic risks

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Reverse logistic | [89] | Prioritizing barriers in reverse logistics of E-commerce supply chain using fuzzy-analytic hierarchy process | Electronic Commerce Research |
| | [94] | Forward and reverse logistics network and route planning under the environment of low-carbon emissions: A case study of Shanghai fresh food E-commerce enterprises. | Computers & Industrial Engineering |
| | [22] | To study game coordination mechanism for closed-loop supply chain in rural e-commerce | Journal of Physics: Conference Series |
| | [38] | Issues in emerging home delivery operations | Document : University of California, Transportation Center, Los Angeles, CA |

## 4.5 E-commerce other risks

Other risks include risks associated with electronic commerce development, as well as risks associated with e-commerce projects. Concerning the risks associated with the development of online purchasing, [1] established an empirical study of the risks associated with the development of electronic commerce, which included the following risks: Risks associated with resources risk, requirements risk, vendor quality risk, risks associated with client-server security, legal risk, managerial risk, outsourcing risk, physical security risk, cultural risk, and reengineering risk. Similarly, according to research performed by [83], they identified several other risks affecting electronic commerce, including strategic risk, client risk, asset depreciation risk, strategic Risk, customer Risk, Asset Impairment Risk, Competitive Risk, Reputation Risk, Financial Risk, Fiscal Risk, Regulatory Risk, and, Legal Risk. [96] divides e-commerce risk into four categories: technical risk, individual risk, economic risk, and societal risk. The technical risk level seeks to highlight risks from a technology perspective. The individual risk concerns the confidentiality of users. The economic risk level comprises the economic impacts that are immediately reflected in sales loss or indirectly in image loss. The societal risk level defines societal threats such as cyber terrorism and industrial espionage etc... [72] categorize e-commerce risks as technical and operational risks. These risks include the visibility of hardware and software failures, hacking and denial-of-service assaults, and internal security breaches. Additionally, [97] they have found that the frequent emergence of risks associated with online media**,** such as security flaws, trust issues (for example, download delays, interface limitations, and so on), and other risks causing damage or customer dissatisfaction, hurt business performance. Last, [98] identify some risks inherent in e-commerce projects, such as inter-platform compatibility, firm restructuring, security, competition, and system reliability. **Table 5** shows the publications presenting e-commerce other risks.

**Table 5** E-commerce Other Risks

| Type of risk | Authors | Title | Journal |
|---|---|---|---|
| Risks associated with E-commerce development | [1] | Potential risks to e-commerce development using exploratory factor analysis | International Journal of Services Technology and Management |
| | [96] | Insurability of electronic commerce risks | Proceedings of the 35th Annual Hawaii International Conference on System Sciences |
| | [83] | Risk in supply networks | Journal of Purchasing and Supply management |
| | [72] | Electronic Commerce Risk: The Role for Standards | Proceedings of the Twelfth Australasian Conference on Information Systems |
| Risk inherent to e-commerce projects | [98] | Time-based management of project planning in e-commerce deployment | Proceedings of the 2000 IEEE International Conference on Management of Innovation and Technology. ICMIT 2000. 'Management in the 21st Century (Cat. No.00EX457) |
| Media risk | [97] | Current technological impediments to business-to-consumer electronic commerce | Communications of the Association for Information systems |

## 5. CONCLUSION

E-commerce serves to satisfy the needs of a wide range of customers by selling products or services. As a result, every online merchant has to improve on the growing number of points of failure that affect the flow and maintain operational performance. This document focuses on the various risks of e-commerce: operational risks directly related to logistics, risks related to customer privacy, and security of online transactions, mainly those affecting environmental sustainability.

From this risk review, we found that as information technology advances, it becomes easier to address, eliminate, and manage identified operational risks. On the other hand, e-commerce is developing rapidly, and sales of products and services continue to increase, resulting in soaring fuel consumption, which leads to environmental pollution and thus risks affecting environmental sustainability. Is still a little difficult to manage. Fuel and package consumption in e-commerce remains high compared to traditional retail stores. Environmentally friendly transportation and packaging solutions are still expensive and difficult to manage for e-merchant who wants to serve and satisfy their customers in a highly competitive world. To this end, future research should focus on risk prevention and risk management to make e-commerce more resilient to disruptions and risks.

## 6. REFERENCES

[1] F. K. T. Wat, E. W. T. Ngai, and T. C. E. Cheng, "Potential risks to e-commerce development using exploratory factor analysis," IJSTM, vol. 6, no. 1, p. 55, 2005, doi: 10.1504/IJSTM.2005.006544.

[2] Z. Vladimir, "Electronic commerce: structures and issues," International journal of electronic commerce, vol. 1, no. 1, pp. 3–23, 1996.

[3] R. Kalakota and A. B. Whinston, Frontiers of electronic commerce. Addison Wesley Longman Publishing Co., Inc., 1996.

[4] R. T. Wigand, "Electronic Commerce: Definition, Theory, and Context," The Information Society, vol. 13, no. 1, pp. 1–16, Mar. 1997, doi: 10.1080/019722497129241.

[5] Associate Professor, Department of Management Studies, Jagannath University, Dhaka-1100, Bangladesh and Md. Mohiuddin, "Overview the E-Commerce in Bangladesh," IOSRJBM, vol. 16, no. 7, pp. 01–06, 2014, doi: 10.9790/487X-16720106.

[6] J. F. George, "Influences on the intent to make Internet purchases," Internet Research, 2002.

[7] E. A. Rosa, "Metatheoretical foundations for post-normal risk," Journal of Risk Research, vol. 1, no. 1, pp. 15–44, Jan. 1998, doi: 10.1080/136698798377303.

[8] S. Campbell, "Determining overall risk," Journal of Risk Research, vol. 8, no. 7–8, pp. 569–581, Oct. 2005, doi: 10.1080/13669870500118329.

[9] S. Seuring and S. Gold, "Conducting content-analysis based literature reviews in supply chain management," Supply Chain Management: An International Journal, 2012.

[10] A. Fink, Conducting research literature reviews: From the internet to paper. Sage publications, 2019.

[11] J. F. F. Lapeña and W. C. G. Peh, "Various Types of Scientific Articles," in A Guide to the Scientific Career, 1st ed., M. Shoja, A. Arynchyna, M. Loukas, A. V. D'Antoni, S. M. Buerger, M. Karl, and R. S. Tubbs, Eds. Wiley, 2019, pp. 351–355. doi: 10.1002/9781118907283.ch37.

[12] B. Doolin, S. Dillon, F. Thompson, and J. L. Corner, "Perceived risk, the Internet shopping experience and online purchasing behavior: A New Zealand perspective," Journal of Global Information Management (JGIM), vol. 13, no. 2, pp. 66–88, 2005.

[13] M. Hafiani and M. Maslouhi, "Supply Chain Risks: A Review Study," p. 9, 2021.

[14] A. Xanthopoulos, D. Vlachos, and E. Iakovou, "Optimal newsvendor policies for dual-sourcing supply chains: A disruption risk management framework," Computers & Operations Research, vol. 39, no. 2, pp. 350–357, Feb. 2012, doi: 10.1016/j.cor.2011.04.010.

[15] M. S. Sodhi, B.-G. Son, and C. S. Tang, "Researchers' Perspectives on Supply Chain Risk Management: Perspectives on Supply Chain Risk Management," Production and Operations Management, vol. 21, no. 1, pp. 1–13, Jan. 2012, doi: 10.1111/j.1937-5956.2011.01251.x.

[16] S. Mulpuru, "The state of retailing online 2013: key metrics and initiatives,"

Forrester. Retrieved January, vol. 30, 2013.
[17] H. Aronsson and M. H. Brodin, "The environmental impact of changing logistics structures," The international journal of logistics management, 2006.
[18] J. B. Edwards, A. C. McKinnon, and S. L. Cullinane, "Comparative analysis of the carbon footprints of conventional and online retailing: A 'last mile' perspective," International Journal of Physical Distribution & Logistics Management, 2010.
[19] M. Winter and A. M. Knemeyer, "Exploring the integration of sustainability and supply chain management: Current state and opportunities for future inquiry," Int Jnl Phys Dist & Log Manage, vol. 43, no. 1, pp. 18–38, Jan. 2013, doi: 10.1108/09600031311293237.
[20] S. M. Abukhader and G. Jönson, "The environmental implications of electronic commerce: A critical review and framework for future investigation," Management of Environmental Quality: An International Journal, 2003.
[21] E. Williams and T. Tagami, "Energy use in sales and distribution via e-commerce and conventional retail: A case study of the Japanese book sector," Journal of Industrial Ecology, vol. 6, no. 2, pp. 99–114, 2002.
[22] Y. Wang and G. Zhang, "To study game coordination mechanism for closed-loop supply chain in rural e-commerce," J. Phys.: Conf. Ser., vol. 1437, p. 012106, Jan. 2020, doi: 10.1088/1742-6596/1437/1/012106.
[23] H. S. Matthews, E. Williams, T. Tagami, and C. T. Hendrickson, "Energy implications of online book retailing in the United States and Japan," Environmental Impact Assessment Review, vol. 22, no. 5, pp. 493–507, 2002.
[24] E. Demir, Y. Huang, S. Scholts, and T. Van Woensel, "A selected review on the negative externalities of the freight transportation: Modeling and pricing," Transportation Research Part E: Logistics and Transportation Review, vol. 77, pp. 95–114, May 2015, doi: 10.1016/j.tre.2015.02.020.
[25] H. Wu and S. C. Dunn, "Environmentally responsible logistics systems," International Journal of Physical Distribution & Logistics Management, vol. 25, no. 2, pp. 20–38, Mar. 1995, doi: 10.1108/09600039510083925.
[26] R. Mangiaracina, G. Marchet, S. Perotti, and A. Tumino, "A review of the environmental implications of B2C e-commerce: a logistics perspective," International Journal of Physical Distribution & Logistics Management, vol. 45, no. 6, pp. 565–591, Jul. 2015, doi: 10.1108/IJPDLM-06-2014-0133.
[27] A. Wiese, W. Toporowski, and S. Zielke, "Transport-related CO2 effects of online and brick-and-mortar shopping: A comparison and sensitivity analysis of clothing retailing," Transportation Research Part D: Transport and Environment, vol. 17, no. 6, pp. 473–477, 2012.
[28] R. Velazquez and S. M. Chankov, "Environmental Impact of Last Mile Deliveries and Returns in Fashion E-Commerce: A Cross-Case Analysis of Six Retailers," in 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), Dec. 2019, pp. 1099–1103. doi: 10.1109/IEEM44572.2019.8978705.
[29] A. C. Faruk, R. C. Lamming, P. D. Cousins, and F. E. Bowen, "Analyzing, Mapping, and Managing Environmental Impacts along Supply Chains," Journal

of Industrial Ecology, vol. 5, no. 2, pp. 13–36, Mar. 2001, doi: 10.1162/10881980152830114.

[30] H. S. Matthews and C. T. Hendrickson, "The Economic and Environmental Implications of Centralized Stock Keeping," Journal of Industrial Ecology, vol. 6, no. 2, pp. 71–81, 2002, doi: 10.1162/108819802763471799.

[31] J. Allen and M. Browne, "Vans and the Economy," 2010.

[32] S. Seebauer, V. Kulmer, M. Bruckner, and E. Winkler, "Carbon emissions of retail channels: the limits of available policy instruments to achieve absolute reductions," Journal of Cleaner Production, vol. 132, pp. 192–203, Sep. 2016, doi: 10.1016/j.jclepro.2015.02.028.

[33] M. Moroz and Z. Polkowski, "The last mile issue and urban logistics: choosing parcel machines in the context of the ecological attitudes of the Y generation consumers purchasing online," Transportation Research Procedia, vol. 16, pp. 378–393, 2016.

[34] M. Browne, C. Rizet, S. Anderson, J. Allen, and B. Keïta, "Life cycle assessment in the supply chain: a review and case study," Transport Reviews, vol. 25, no. 6, pp. 761–782, 2005.

[35] M. Savelsbergh and T. Van Woensel, "50th Anniversary Invited Article—City Logistics: Challenges and Opportunities," Transportation Science, vol. 50, no. 2, pp. 579–590, May 2016, doi: 10.1287/trsc.2016.0675.

[36] M. Velásquez, A.-R. Ahmad, and M. Bliemel, "State-of-the-art in e-commerce carbon footprinting," Journal of Internet Banking and Commerce, vol. 14, no. 3, pp. 1–21, 2009.

[37] F. McLeod, T. Cherrett, and L. Song, "Transport impacts of local collection/delivery points," vol. 9, no. 3, pp. 307–317, 2006.

[38] M. Park and A. Regan, "Issues in home delivery operations." University of California, Transportation Center, Los Angeles, CA, 2004.

[39] M. Freitag, H.-D. Haasis, H. Kotzab, and J. Pannek, Eds., Dynamics in Logistics: Proceedings of the 7th International Conference LDIC 2020, Bremen, Germany. Cham: Springer International Publishing, 2020. doi: 10.1007/978-3-030-44783-0.

[40] C. Borggren, Å. Moberg, and G. Finnveden, "The environmental impact of changing logistics structures," The International Journal of Life Cycle Assessment, vol. 16, no. 2, pp. 138–147, 2011.

[41] P. van Loon, L. Deketele, J. Dewaele, A. McKinnon, and C. Rutherford, "A comparative analysis of carbon emissions from online retailing of fast moving consumer goods," Journal of Cleaner Production, vol. 106, pp. 478–486, Nov. 2015, doi: 10.1016/j.jclepro.2014.06.060.

[42] J. Laghaei, A. Faghri, and M. Li, "Impacts of home shopping on vehicle operations and greenhouse gas emissions: multi-year regional study," International Journal of Sustainable Development & World Ecology, vol. 23, no. 5, pp. 381–391, Sep. 2016, doi: 10.1080/13504509.2015.1124471.

[43] D. Ducarme and P. J. Agrell, "Sustainable solutions for 'last mile' deliveries in the parcel industry: A qualitative analysis using insights from third-party logistics service providers and public mobility experts." Louvain School of Management, Université catholique de Louvain, Louvain, 2019.

[44] Y. H. V. Lun, "Green management practices and firm performance: A case of container terminal operations," Resources, Conservation and Recycling, vol. 55, no. 6, pp. 559–566, Apr. 2011, doi: 10.1016/j.resconrec.2010.12.001.
[45] J. Qin, H. Fu, Z. Wang, and L. Xia, "Financing and carbon emission reduction strategies of capital-constrained manufacturers in E-commerce supply chains," International Journal of Production Economics, vol. 241, p. 108271, Nov. 2021, doi: 10.1016/j.ijpe.2021.108271.
[46] E. Taniguchi and T. Kakimoto, "Effects of e-commerce on urban distribution and the environment," Journal of Eastern Asia Society for Transportation Studies, vol. 5, pp. 2355–2366, 2003.
[47] A. C. McKinnon, Ed., Green logistics: improving the environmental sustainability of logistics. London ; Philadelphia: Kogan Page, 2010.
[48] E. Williams and T. Tagami, "Energy use in sales and distribution via e-commerce and conventional retail: A case study of the Japanese book sector," Journal of Industrial Ecology, vol. 6, no. 2, pp. 99–114, 2002.
[49] A. McKinnon and M. Piecyk, "SETTING TARGETS FOR REDUCING CARBON EMISSIONS FROM," Carbon Management, vol. 3, no. 6, pp. 629–639, Dec. 2012, doi: 10.4155/cmt.12.62.
[50] A. Bhatnagar, S. Misra, and H. R. Rao, "On risk, convenience, and Internet shopping behavior," Communications of the ACM, vol. 43, no. 11, pp. 98–105, 2000.
[51] S. J. Tan, "Strategies for reducing consumers' risk aversion in Internet shopping," Journal of consumer marketing, 1999.
[52] L. G. Schiffman and L. L. Kanuk, "Consumer Behavior (eight edit)." New Jersey: Pearson Education, 2007.
[53] S. L. Jarvenpaa and P. A. Todd, "Consumer reactions to electronic shopping on the World Wide Web," International Journal of electronic commerce, vol. 1, no. 2, pp. 59–88, 1996.
[54] M. Gerber and R. von Solms, "From risk analysis to security requirements," Computers & Security, vol. 20, no. 7, pp. 577–577, 2001.
[55] N. Chawla and B. Kumar, "E-Commerce and Consumer Protection in India: The Emerging Trend," J Bus Ethics, Jul. 2021, doi: 10.1007/s10551-021-04884-3.
[56] P. Sinha, U. Sharma, D. Kumar, and A. Rana, "A Conceptual Framework for Mitigating the Risk in eCommerce Websites," in 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO), 2020, pp. 217–221.
[57] A. D. Miyazaki and A. Fernandez, "Consumer Perceptions of Privacy and Security Risks for Online Shopping," Journal of Consumer Affairs, vol. 35, no. 1, pp. 27–44, Jun. 2001, doi: 10.1111/j.1745-6606.2001.tb00101.x.
[58] A. Dolgui, D. Ivanov, and B. Sokolov, "Ripple effect in the supply chain: an analysis and recent literature," International Journal of Production Research, vol. 56, no. 1–2, pp. 414–430, 2018.
[59] S. M. Furnell and T. Karweni, "Security implications of electronic commerce: a survey of consumers and businesses," Internet research, 1999.
[60] D. L. Hoffman, T. P. Novak, and M. Peralta, "Building consumer trust online,"

Communications of the ACM, vol. 42, no. 4, pp. 80–85, 1999.
[61] H. Wang, M. K. Lee, and C. Wang, "Consumer privacy concerns about Internet marketing," Communications of the ACM, vol. 41, no. 3, pp. 63–70, 1998.
[62] K. Lm, "ANALYSIS OF E-COMMERCE RISK TYPOLOGIES," 2021, doi: 10.24412/2520-6990-2021-1097-23-29.
[63] F. B. Schneider and N. R. Council, Trust in cyberspace. National Academy Press Washington, DC, 1999.
[64] A. Zuccato, "Holistic security requirement engineering for electronic commerce," Computers & Security, vol. 23, no. 1, pp. 63–76, 2004.
[65] S. W. Tak and E. K. Park, "A Software Framework for Non-Repudiation Service based on Adaptive~Secure Methodology in Electronic Commerce," Information Systems Frontiers, vol. 6, no. 1, pp. 47–66, Mar. 2004, doi: 10.1023/B:ISFI.0000015874.51455.ab.
[66] T. A. Malapane, "A Risk Analysis of E-Commerce: A Case of South African Online Shopping Space," in 2019 Systems and Information Engineering Design Symposium (SIEDS), Charlottesville, VA, USA, Apr. 2019, pp. 1–6. doi: 10.1109/SIEDS.2019.8735643.
[67] N. Lim, "Consumers' perceived risk: sources versus consequences," Electronic commerce research and applications, vol. 2, no. 3, pp. 216–228, 2003.
[68] B. J. Finch, "Customer expectations in online auction environments: An exploratory study of customer feedback and risk," Journal of Operations Management, vol. 25, no. 5, pp. 985–997, 2007.
[69] L. R. Vijayasarathy and J. M. Jones, "Print and Internet catalog shopping: assessing attitudes and intentions," Internet Research, 2000.
[70] C. F. Hofacker and J. Murphy, "Clickable World Wide Web banner ads and content sites," Journal of Interactive Marketing, vol. 14, no. 1, pp. 49–59, 2000.
[71] C. F. Hofacker, Internet marketing. John Wiley & Sons, Inc., 2000.
[72] E. Jordan and D. Musson, "Electronic Commerce Risk: The Role For Standards," 2001.
[73] T.-M. Choi, C.-H. Chiu, and H.-K. Chan, "Risk management of logistics systems," Transportation Research Part E: Logistics and Transportation Review, vol. 90, pp. 1–6, Jun. 2016, doi: 10.1016/j.tre.2016.03.007.
[74] I. Manuj and J. T. Mentzer, "Global supply chain risk management," Journal of business logistics, vol. 29, no. 1, pp. 133–155, 2008.
[75] P. Mensah and Y. Merkuryev, "Developing a resilient supply chain," Procedia-Social and behavioral sciences, vol. 110, pp. 309–319, 2014.
[76] N. Pezderka and R. R. Sinkovics, "A conceptualization of e-risk perceptions and implications for small firm active online internationalization," International Business Review, vol. 20, no. 4, pp. 409–422, Aug. 2011, doi: 10.1016/j.ibusrev.2010.06.004.
[77] G. A. Zsidisin, L. M. Ellram, J. R. Carter, and J. L. Cavinato, "An analysis of supply risk assessment techniques," International Journal of Physical Distribution & Logistics Management, 2004.
[78] G. Xu, X. Qiu, M. Fang, X. Kou, and Y. Yu, "Data-driven operational risk analysis in E-Commerce Logistics," Advanced Engineering Informatics, vol. 40,

pp. 29–35, Apr. 2019, doi: 10.1016/j.aei.2019.03.001.
[79] P. Dutta, P. Suryawanshi, P. Gujarathi, and A. Dutta, "Managing risk for e-commerce supply chains: an empirical study," IFAC-PapersOnLine, vol. 52, no. 13, pp. 349–354, 2019, doi: 10.1016/j.ifacol.2019.11.143.
[80] S. Chopra and M. S. Sodhi, "Supply-chain breakdown," MIT Sloan management review, vol. 46, no. 1, pp. 53–61, 2004.
[81] D. Ivanov, A. Dolgui, B. Sokolov, and M. Ivanova, "Literature review on disruption recovery in the supply chain," International Journal of Production Research, vol. 55, no. 20, pp. 6158–6174, Oct. 2017, doi: 10.1080/00207543.2017.1330572.
[82] Y. Shang, D. Dunson, and J.-S. Song, "Exploiting Big Data in Logistics Risk Assessment via Bayesian Nonparametrics," Operations Research, vol. 65, no. 6, pp. 1574–1588, Dec. 2017, doi: 10.1287/opre.2017.1612.
[83] C. Harland, R. Brenchley, and H. Walker, "Risk in supply networks," Journal of Purchasing and Supply management, vol. 9, no. 2, pp. 51–62, 2003.
[84] S. K. Kumar, M. K. Tiwari, and R. F. Babiceanu, "Minimisation of supply chain cost with embedded risk using computational intelligence approaches," International Journal of Production Research, vol. 48, no. 13, pp. 3717–3739, 2010.
[85] G. Svensson, "A conceptual framework of vulnerability in firms' inbound and outbound logistics flows," International Journal of Physical Distribution & Logistics Management, 2002.
[86] M. E. Johnson, "Learning from Toys: Lessons in Managing Supply Chain Risk from the Toy Industry," California Management Review, vol. 43, no. 3, pp. 106–124, Apr. 2001, doi: 10.2307/41166091.
[87] M. Giuffrida, R. Mangiaracina, A. Perego, and A. Tumino, "Cross-border B2C e-commerce to China: An evaluation of different logistics solutions under uncertainty," IJPDLM, vol. 50, no. 3, pp. 355–378, Dec. 2019, doi: 10.1108/IJPDLM-08-2018-0311.
[88] L. Ouabouch and G. Paché, "Risk management in the supply chain: characterization and empirical analysis," Journal of Applied Business Research (JABR), vol. 30, no. 2, pp. 329–340, 2014.
[89] D. Lamba, D. K. Yadav, A. Barve, and G. Panda, "Prioritizing barriers in reverse logistics of E-commerce supply chain using fuzzy-analytic hierarchy process," Electron Commer Res, vol. 20, no. 2, pp. 381–403, Jun. 2020, doi: 10.1007/s10660-019-09333-y.
[90] D. S. Rogers and R. S. Tibben-Lembke, "«Reverse logistics»: stratégies et techniques," Logistique & Management, vol. 7, no. 2, pp. 15–25, 1999.
[91] K. Govindan, R. Khodaverdi, and A. Jafarian, "A fuzzy multi criteria approach for measuring sustainability performance of a supplier based on triple bottom line approach," Journal of Cleaner Production, vol. 47, pp. 345–354, May 2013, doi: 10.1016/j.jclepro.2012.04.014.
[92] D. S. Rogers and R. Tibben-Lembke, "An examination of reverse logistics practices," Journal of business logistics, vol. 22, no. 2, pp. 129–148, 2001.
[93] N. Janakiraman, H. A. Syrdal, and R. Freling, "The effect of return policy

leniency on consumer purchase and return decisions: A meta-analytic review," Journal of Retailing, vol. 92, no. 2, pp. 226–235, 2016.

[94] J. Guo, X. Wang, S. Fan, and M. Gen, "Forward and reverse logistics network and route planning under the environment of low-carbon emissions: A case study of Shanghai fresh food E-commerce enterprises," Computers & Industrial Engineering, vol. 106, pp. 351–360, Apr. 2017, doi: 10.1016/j.cie.2017.02.002.

[95] K. Govindan and H. Soleimani, "A review of reverse logistics and closed-loop supply chains: a Journal of Cleaner Production focus," Journal of Cleaner Production, vol. 142, pp. 371–384, 2017.

[96] T. Grzebiela, "Insurability of electronic commerce risks," in Proceedings of the 35th Annual Hawaii International Conference on System Sciences, Big Island, HI, USA, 2002, p. 9. doi: 10.1109/HICSS.2002.994177.

[97] G. Rose, H. M. Khoo, and D. Straub, "Current technological impediments to business-to-consumer electronic commerce," Communications of the Association for Information systems, vol. 1, no. 1, p. 16, 1999.

[98] B. C. M. Fong, C. H. Y. Chan, and A. C. M. Fong, "Time-based management of project planning in e-commerce deployment," in Proceedings of the 2000 IEEE International Conference on Management of Innovation and Technology. ICMIT 2000. "Management in the 21st Century" (Cat. No.00EX457), Singapore, 2000, vol. 2, pp. 648–652. doi: 10.1109/ICMIT.2000.916769.