A Novel Taxonomy for Risks in Agribusiness Supply Chains: A Systematic Literature Review

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Abstract: Agribusiness supply chain (ASC) risk is currently a major business problem throughout the world. The current trend of globalisation has affected every business, and supply chain risks have become a concern in logistics and other business processes. Current risk management strategies must address a variety of global and local challenges. To tackle this issue, existing research has analysed risks in agrifood supply chains, ASC risk management, disruption in ASCs, risk assessments of agriculture supply chains and sources of risk facing an agricultural supply chain. However, the existing research has not defined and categorised risks as a basis for managing risks in ASCs. Therefore, the definition and categorisation of risks in the ASC has been overlooked. To address this gap, this paper undertakes a systematic literature review, offering constructs to define and categorise risks in ASCs, and develops a novel taxonomy in ASC risks to enrich future research on ASC risk management. Sixty-one articles from six databases published between 2000 and 2020 underwent descriptive and thematic analysis.

Keywords: taxonomy; risk; agribusiness supply chain; systematic literature review

1. Introduction

Risks in agribusiness supply chains (ASCs) are a major business problem today throughout the world. The current trend of globalisation affects every business, both individual and business entities, and supply chain risks (SCRs) have become a significant concern in logistics and other business processes. Therefore, each organisation strives to manage SCRs effectively and efficiently to achieve success and uninterrupted operations [1–4]. The design of risk management strategies by every actor, including input suppliers, farmers, retailers, processors, distributors, traders and exporters, must be able to respond to challenges, both globally and locally, considering the various risks and changes that occur [5,6]. ASC risk management is more complicated than risk management in manufacturing supply chains because of product characteristics such as seasonality, bulkiness, supply spikes and perishability [7]. Moreover, in ASCs, supply chain lead times from raw materials to the customer can often be very long, sometimes running into months, particularly in the traditional supply chain context [8]. Therefore, the flow of goods among supply chain participants must be considered carefully to avoid the risk of damage to goods and financial losses [9,10].

Various ASC actors are involved in distributing goods and services from the point of production to the end of consumption [6,10,11], and the risks and uncertainties experienced by each actor differ. For instance, risks such as changes in the weather and the incidence of pests and diseases affect production [12], whereas collectors might face challenges related to the distance and travel time needed to collect agricultural products; the place of temporary storage; and the type of vehicle used to transport agricultural products. Distance, time, location and means of transportation to be used are important factors that must be considered adequately to avoid or minimise the risk of product damage [10].
Likewise, other actors such as processors, traders and exporters must pay attention not only to the quantity of the products but also to their quality so that they do not lose the value of the product.

Various studies have been conducted related to risks in agrifood supply chains [11,13,14], ASC risk management [7], disruption in ASCs [15,16], risk assessments of agriculture supply chains [17,18], sources of risk facing an agricultural supply chain [6] and risks in manufacturing [19,20]. However, the existing literature has not defined and categorised risks in ASCs as a basis for understanding risks in ASCs. Therefore, the definition and categorisation of risks in ASCs has been overlooked. To address this gap, this paper undertakes a systematic literature review (SLR) to define and categorise risks in ASCs. The main research question addressed in this paper is: what is the definition and categorisation of risks in ASC? In particular:

1. What constructs can be used to define risks in ASCs?
2. What kind of risks can be categorised within ASCs?
3. How do they affect supply chain performance?

To accomplish this:

a. The constructs used to define ASC risks are explored.
b. A novel taxonomy is developed to enrich future research directions for ASC risks.

The remainder of this paper is organised as follows. Section 2 describes the procedures and methods for implementing the SLR. Section 3 summarises the findings related to the number of articles published in major journals. Section 4 discusses the results of descriptive and thematic analysis, followed by future research agenda arising from the gaps identified. Finally, the conclusions and limitations of the SLR are discussed.

2. Materials and Methods

An SLR is used to manage the diversity of knowledge for specific academic investigations and to enable researchers to map and assess existing intellectual areas and to define research questions to further develop the existing body of knowledge [21]. According to Green (2010) [22], conducting a research literature review is intended to inform readers how to find, evaluate and analyse research literature to discover what is known about a topic. Herein, the SLR will employ content analysis to provide new insights into data or knowledge found in the existing literature and facilitate practical guidance [23].

The SLR is based on the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) framework [24] and consists of four phases: identification (phase 1), eligibility (phase 2), screening (phase 3) and included (phase 4). Figure 1 shows the complete methodological process used in the research. The PRISMA framework was adopted as it allows researchers to conduct systematic reviews and critically assess, collect and analyse existing research, studies and literature.
Figure 1. The four-phase systematic literature review framework based on the PRISMA (adapted from Moher et al., 2009) [24].

2.1. Phase 1: Identification

The first phase of this review was identifying papers related to the topic through a database search. Papers identified through the databases search were purposed to address the formulation of the scope of study [25], research questions and objectives, which were clearly described and discussed in the introduction section. The initial search was conducted in December 2020, using various electronic databases, including Web of Science (WoS), Scopus, Emerald Insight, Science Direct, Taylor and Francis, and Google Scholar. The main reason for using these databases is that they are considered extensive, are available at academic institutions [25,26] and have been used by previous reviews [25–28]. The search strings were formed by connecting the keywords using Boolean connectors such as “OR” and “AND” to enable an advanced search for the review. The search strings were developed with the phrases of “agribusiness supply chain risk” or “agribusiness supply chain” combined with other keywords associated with “risk” (see Table 1).

WoS and Scopus were chosen as primary database searches. WoS provides a comprehensive platform that allows researchers and other users to track ideas across disciplines and over time from nearly 1.9 billion references cited from over 171 million records [29]. Meanwhile, Scopus is the largest abstract and citation database of peer-reviewed literature such as scientific journals, books and conference proceedings [30]. Scopus has more than 36,000 titles from approximately 11,678 publishers, of which 34,346 are peer-reviewed journals in top-level subject fields such as life sciences, social sciences, physical sciences and health...
sciences [31]. There were 2717 papers related to 13 keywords (breakdown from the main keywords) available from the WoS database and 3952 papers from the Scopus database.

Table 1. Keyword Search.

| No | Keywords                                                                 |
|----|--------------------------------------------------------------------------|
| I  | Agribusiness supply chain risk AND "definition" AND “classification” OR “categorization” |
| II | Agribusiness supply chain AND “definition”                                |
| III| Agribusiness AND “definition” AND “supply chain” AND supply chain risk” AND “risk” OR “disruption” OR “vulnerability” |
| IV | Supply chain AND “definition”                                             |
| V  | Supply chain risk AND “definition” AND “categorisation” OR “classification” |

Emerald Insight, Science Direct, Taylor and Francis, and Google Scholar were used as secondary sources for further confirmation. For instance, some papers related to the ASC could not be downloaded through the WoS database but subsequently could be found in the Google Scholar database. There were more than 201 papers related to the keywords “agribusiness supply chain risk” available from Emerald Insight, 1726 papers from Science Direct, 100 papers from Taylor and Francis, and 54,500 papers from Google Scholar.

2.2. Phase 2: Eligibility

The second phase of the SLR was about the eligibility of papers after applying inclusion and exclusion criteria. Herein, suitable inclusion criteria are outlined to ensure that research question boundaries are clearly defined. The inclusion criteria and rationale for guiding the SLR of this topic are given in Table 2.

There were three inclusion criteria for this review. First, documents must be published in peer-reviewed journals, books and conference papers. The main reason is that peer-reviewed journals are of higher quality and are more reliable than non-peer-reviewed articles. Besides, books and conference papers are also relevant and reliable for addressing research questions. Thus, any papers in non-peer-reviewed journals, books and conference papers were eliminated. The result of this refinement process was 2671 articles collected from WoS and 3862 articles from Scopus, followed by 209 articles from Emerald Insight, 1586 papers from Science Direct, 100 articles from Taylor and Francis, and 19,300 articles from Google Scholar. Second, the search of published papers was limited from January 2000 to January 2021. The year 2000 was selected as a starting point because supply chain risk management (SCRM) has become an essential research topic in the past two decades [32], transitioning from an emerging topic to a growing and broad research area [7,32–34], and risk in the ASC is one of the research areas that relates to SCRM. Third, all papers must be published in English. Thus, any papers in other languages were eliminated.

Table 2. Inclusion criteria and rationale for guiding systematic literature review of risk in the agribusiness supply chain.

| Inclusion Criteria                                                                 | Rationale                                                                 | Exclusion Criteria                                                                 |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Published in peer-reviewed journals, books and conference papers.                 | Peer-reviewed journals are of higher quality and reliability than non-peer-reviewed articles. Besides, books and conference papers are also relevant and reliable for addressing the research questions. | Any papers in non-peer-reviewed journals, books and conference papers will be eliminated. |
| Selection of papers published 2000–2021                                            | The year 2000 was selected as a starting point because supply chain risk management (SCRM) has been an essential research topic in the past two decades [32]; it has transitioned from an emerging topic to a growing and broad research area [7,32–34], and risk in agribusiness supply chain is one of the research areas that is related to SCRM. | Up to the end of January 2021. |
| Published in the English language.                                                 | English is the dominant language in the field of agribusiness supply chain risk research. | Any publication before 2000 will be excluded. |
2.3. Phase 3: Screening

Screening was the third phase of the SLR. At this stage, all the eligible papers were sorted out for further investigation to assess their relevance to the research questions. Duplications of articles were removed, leading to a total of 77 papers from the WoS (43 articles) and Scopus (34 articles) databases, as well as 86 papers from Emerald Insight, 102 from Science Direct, 40 from Taylor and Francis, and 19 from Google Scholar. Then, the articles were filtered by their titles, abstracts and keywords to exclude any irrelevant papers, and several papers were excluded as they were outside the scope of the study. This process resulted in the identification of 27,327 irrelevant articles. Further, 324 relevant articles were read thoroughly to ensure that the article aligned with the research questions. The purpose of this step was to define and identify risks associated with the ASC. Finally, there were 324 papers that met the inclusion criteria of the screening process.

2.4. Phase 4: Included

At this stage, the final papers were reviewed systematically for descriptive and thematic analysis. Descriptive analysis involved the processes of mapping all the information provided within the articles, including context, scope and publication year. Research gaps in ASC risks were identified to provide a direction for future research. In addition, thematic analysis involved the processes of reading the selected literature and extracting the common themes [35]. At the end of this stage, 61 articles from the databases were ready to be reviewed.

3. Results

3.1. Descriptive Analysis

In the descriptive analysis, selected articles were categorised based on the research context, scope and year of publication. The publication number based on country of study can be seen in Figure 2.

Figure 2. Publication numbers based on country of study.

Figure 2 shows that the selected articles are very distinct in terms of context, with 20 different countries identified. As shown, 28% of the papers were published in the USA (17 articles); 15% in the UK (9 articles); 8% in Australia (5 articles); and 5% each in Switzerland, India and New Zealand (3 articles each). Other countries accounted for 2% or 3% of the articles each, including Sweden, Finland, Iran, Malaysia, UAE, Italy, Mexico, Indonesia, the Netherlands, Switzerland, Germany, Russia, France, China, Croatia and unspecified countries. Further, the proportions of articles used to define and categorise risk in the ASC are depicted in Figure 3. The 61 selected articles were distributed from 2000 to 2020 and divided into five constructs: agribusiness, supply chain, SCR, agribusiness risk, ASC and ASC risk.
Figure 3 shows that the majority of the articles discussed SCR (52%), while only small portions discussed the terms ASC (5%), agribusiness (7%), supply chain (10%), agribusiness risk (13%) and ASC risk (13%). Thus, the term SCR is the main construct that has been used in the literature compared with other terms, particularly ASC risk. Only one paper was found from the databases employing the term ASC risk [7]. However, no definition and categorisation of ASC risk is provided by the authors.

Further, the articles were analysed with respect to the year of publication, as shown in Figure 4. The results clearly reveal that there was a fluctuation in the number of publications related to agribusiness, supply chain, SCR, agribusiness risk and ASC risk from 2000 to 2020. However, the publication trend has been gaining the attention of researchers since 2000, and there has been accelerated progress in the research field, particularly in 2011, 2017 and 2019. This is evidenced by the emergence of new research topics in the field of ASC risk, which developed from prior studies in the fields of agribusiness, supply chain, SCR, agribusiness risk, risk management and SCRM. Research related to SCRM has been widely discussed over two decades, establishing the potential sources of risk and instigating appropriate strategies to mitigate and manage disruptions in supply chains [15,16,36–38].

Moreover, based on the information provided in Figures 3 and 4, no publication addressed ASC risk for more than a decade and a half between 2000 and 2016. This is because studies related to ASC risk are relatively new and still need to be investigated further. This trend manifests as the growing interest of researchers and practitioners in this...
research area and its potential for further growth and research [12]. In short, there is a need to conduct various research related to ASC risk in the future.

3.2. Thematic Analysis

In the thematic analysis, the selected articles were analysed, synthesised and classified into predefined categories such as defining and categorising ASC risk, and understanding how risks affect ASC performance. A detailed discussion of each category follows.

3.2.1. Defining Agribusiness Supply Chain Risk

ASC risk needs to be defined to understand the scope of risks in the ASC. Without a clear definition, researchers’ understanding will vary, which will influence communication with practitioners, access to industry and conducting empirical studies [19]. The authors state that a consistent definition helps researchers identify and measure the likelihood and impact of the entire set of SCR, and evaluate the effectiveness of SCRM methodologies. Therefore, it is essential to obtain a clear definition of the term ASC risk (see Figure 5).

![Figure 5. Integrated concepts for examining agribusiness supply chain risk (ASCR).](image)

In Figure 5, it is clear that ASC risk can be understood through several integrated concepts: supply chain (SC), SCR, agribusiness, agribusiness risk (AR) and ASC. However, while the supply chain concept is a higher-level well-researched theoretical construct, agribusiness presents a context or a particular instance of a supply chain. Therefore, the concept supply chain will be discussed first in general, followed by the constructs of SCR, agribusiness and agribusiness risk, specifically.

Supply Chain

Several researchers have defined the construct supply chain according to their research context, such as [39–44]. For instance, according to Aitken (1998, p. 67) [43], supply chain can be defined as “a network of connected and interdependent organisations mutually and co-operatively working together to control, manage and improve the flow of materials and information from suppliers to end users”. Meanwhile, Christopher (2016, p. 13) [44] defines supply chain as “the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services to the hands of the ultimate consumer”. However, as there is no consensus related to the terms supply chain and supply chain management, these definitions could become too broad or too narrow [45]. Similarly, CSCMP (2021) [46]
state that the supply chain management profession has continued to change and evolve to fit the needs of the growing global supply chain. With the supply chain covering a broad range of disciplines, the definition of what a supply chain is can be unclear [46]. Therefore, this paper refers to LeMay et al. (2017, p. 1446) [45], who have developed standards for assessing definitions of supply chain and supply chain management, and have defined the construct of supply chain management as “the design and coordination of a network through which organisations and individuals get, use, deliver and dispose of material goods; acquire and distribute services; and make their offerings available to markets, customers, and clients”. Moreover, the authors point out that the definitions for supply chain and supply chain management are not necessarily related, even when drawn from the same source, although it might be expected that a definition for supply chain management would use a term such as a substitute for management and then apply that chosen term to the existing definition of supply chain.

In short, the definition of supply chain management provided by LeMay et al. (2017) [45] clearly emphasises several essential points as follows: the design and coordination of a network; organisations and individuals; a variety of activities such as getting, using, delivering and disposing of material goods; acquiring and distributing services; making their offerings available; and recipients such as markets, customers and clients.

Further, to understand the construct of supply chain, Christopher (2016) [44] provides an example of a shirt manufacturer, which is part of a supply chain that extends upstream through the weavers of fabrics to the manufacturers of fibres and downstream through distributors and retailers to the final consumer. However, the author states that each of these organisations in the network is dependent upon each other by definition and yet, paradoxically, by tradition do not closely cooperate with each other. Accordingly, the idea of supply chain integration arises when most organisations view themselves as entities that exist independently of others and need to compete to survive but are reluctant to cooperate to compete. Hence, this kind of philosophy can be detrimental to the organisation itself if it leads to a reluctance to collaborate to compete [44]. Particularly in a dynamic environment, the supply chain is focused on how to manage organisational networks and their activities to meet the demands of end customers from firms [47], and how to achieve efficient coordination of all the operations required to ensure the supply, manufacture and offerings available to the customer [41].

Christopher (2011) [48] stated that the focus of supply chain management is the management of relationships to achieve a more profitable outcome for all parties in the chain. However, in certain circumstances, the chain might have some significant obstacles where there are times when the narrow personal interests of one party must be included in the interests of the whole chain [44]. In addition, Shahbaz, Rm Rasi and Bin Ahmad (2019) [49] stated that the supply chain has three kinds of flow—material, information and financial—and every flow deals with risks; for example, material flow creates logistic risks [50], finance flow causes financial risks and information flow originates information risks [51]. Accordingly, SCR has become an important aspect to understand in this paper.

Supply Chain Risk

Risk has always existed in business and supply chains, and management of SCR has been challenging, particularly during the last two decades [4]. Therefore, for the understanding of SCR, thorough reviews of the literature have been performed by many researchers, and the results have significantly expanded the knowledge and awareness of SCR. However, in terms of defining the concept, there is no consensus on the definition of SCR and SCRM [19,52,53].

Various definitions have been provided for SCR [4,51,53–55]. However, in this paper, the construct SCR is based on Jüttner, Peck and Christopher (2003) [56], who defined SCR as any risks for the information, material and product flows from original supplier to the delivery of the final product for the end user. The authors also explain in simpler terms that SCR refers to the possibility and effect of a mismatch between supply and demand. In other
words, the construct SCR points out the effect of uncertainty that causes disruptions and potential occurrence of an incident or failure in the entire flow of information, materials, services and finances through a network of organisations (e.g., suppliers, manufacturers, logistics providers, wholesalers/distributors and retailers) that aims to produce and deliver products or services for the consumers. Further, various classifications of SCR are given in Table 3.

| Author(s) | Types and Categories of Supply Chain Risks |
|-----------|------------------------------------------|
| Shahbaz, Rm Rasi and Bin Ahmad (2019) [49] | Seven categories of SCR (1) Supply-side risks, (2) Process-side risks, (3) Demand-side risks, (4) Logistic-side risks, (5) Collaboration-side risks, (6) Financial-side risks, and (7) Environment-side risks. |
| Waqas et al. (2019) [57] | Five SCR sources (1) Supply risk, (2) Process risk, (3) Demand risk, (4) Environmental risk, and (5) Financial risk. |
| Christopher (2011) [48]; Prakash, Soni and Rathore (2017) [34]; Bogataj and Bogataj (2007) [58]; Jüttner (2005) [59] | Five categories of SCR sources (1) Supply risk, (2) Demand risk, (3) Process risk, (4) Environmental risk, and (5) Financial risk. |
| Basole et al. (2016) [60]; Ellis, Shockley and Henry (2011) [61]; Lockamy and McCormack (2010) [62] | Three major categories of SCR (1) Internal to organisation also called organisational factors, (2) External to organisation but internal to network also known as industry factors, and (3) External risk sources also called environmental factors. |
| Ho et al. (2015) [19] | Two categories of SCR (1) Operational risks (frequent risk events stemming from inherent supply-demand uncertainty), (2) Catastrophic risks (caused by natural or man-made disasters). |
| Sodhi, Son and Tang (2012) [52] | Two categories of SCR (1) Macro risks (consist of natural risks, e.g., earthquakes and weather-related disasters and man-made risks, e.g., war and terrorism and political instability); (2) Micro risks (demand risk, manufacturing risk, supply risk and infrastructural risk). |
| Tang, O and Nurmaya Musa (2011) [51] | Three classification of SCR (1) Material flow risk (single sourcing risk, sourcing flexibility risk, supplier selection/outsourcing, supply product monitoring/quality and supply capacity), (2) Information flow risk (information accuracy, information system security and disruption), and (3) Financial flow risk (exchange rate risk, price and cost risk, financial strength of supply chain partners and financial handling/practice). |
| Tang and Tomlin (2008) [63] | Six major types of SCR (1) Supply risks (supply cost risks, supply commitment risk), (2) Process risks, (3) Demand risks, (4) Intellectual property risks, (5) Behavioral risks, and (6) Political/social risks. |
| Wagner and Bode (2008) [64]; Wagner and Bode (2006) [65] | Five sources of SCR (1) Demand-side; (2) Supply-side; (3) Regulatory, legal and bureaucratic; (4) Infrastructure; and (5) Catastrophic. |
| Kleindorfer and Saad (2005) [66] | Two broad categories of risk affecting SC design and management (1) Risks arising from the problems of coordinating supply and demand; (2) Risks arising from disruptions to normal activities such as natural disasters, from strikes and economic disruptions, and from acts of purposeful agents, including terrorists. |
| Chopra and Sodhi (2004) [67] | Nine potential SCR (1) Disruptions, (2) Delays, (3) System, (4) Forecast, (5) Intellectual property, (6) Procurement, (7) Receivables, (8) Inventory, and (9) Capacity. |
| Jüttner, Peck and Christopher (2003) [56]; Lin and Zhou (2011) [68]; Enyinda and Mbah (2017) [69]; Ghadge, Dani and Kalawsky (2012) [33] | Three categories of risk sources in supply chains (1) Environmental risk sources (man-made and natural disruptions), (2) Network-related risk sources, and (3) Organisational risk sources (inventory risk, process/operational risk, quality risk and management risk). |
As shown in Table 3, researchers have described various types and categories of SCR. For instance, SCR has been divided into two categories: macro and micro risks [19], or catastrophic and operational [52]. Further, SCR has been divided into five sources: supply, process, demand, environmental and financial [57].

However, Shahbaz, Rm Rasi and Bin Ahmad (2019) [49] have extended the classification of SCR into seven categories: supply-side, process-side, demand-side, logistic-side, collaboration-side, financial-side and environment-side risks. Besides, SCR types can be divided into three categories: organisational risk or internal risk (e.g., process and control risks), network-related risk or risk within the supply chain (e.g., demand and supply risks) and environmental risk or risk in the external environment (e.g., natural disasters, war and terrorism, and political instability) [33,56,68,69].

Agribusiness Supply Chain Risk

The concept of agribusiness was introduced and defined by Davis and Ray A. Goldberg (1957) as the sum total of all operations involved in the manufacture and distribution of farm supplies; the production operations on the farm; and the storage, processing and distribution of farm commodities and items made from these [70–72]. The main idea of the definition formulated by Davis and Goldberg is that the food system needs to be seen as an integrated system. This system will fail if it only focuses on one segment. Therefore, Davis and Goldberg emphasise the importance of the relationship between segments of the food system, in coordination across segments, in the performance of the whole system and in the formulation of strategies in the context of interdependence. In this context, well-designed management strategies and public policy initiatives are indispensable for addressing problems in the food system [71]. Using this definition, Chandrasekaran and Raghuram (2014) [47] emphasise that agribusiness is a complex system reaching beyond the farm and commodities or produce, including everything required to bring food to the consumer, even the challenges of providing inputs to farms for producing food.

Although the two entities, agribusiness and agriculture, have indeed been considered separate for centuries, their similarity was revealed only in the middle of the twentieth century [73]. Further, Gabor Konig, Silva and Mhlanga (2013) [74] state that the agribusiness sector, which comprises the business activities performed from farm to fork, is a major generator of employment and income worldwide. In recent years, the importance of the agribusiness sector has grown significantly as agricultural development strategies shifted from a pure production-oriented approach to a broader systems perspective that emphasises agrifood chain coordination, value creation and the institutional setting under which chains operate.

Agribusiness involves the production, distribution and consumption of food, clothing and even shelter. It includes all economic activity in the food and fibre system, which encompasses the input supply industries; agricultural production and post-harvest; and value-added activities such as commodity processing, food manufacturing and food distribution [73]. Further, the authors explain that agribusiness involves three main activities: first, inputs such as seed, fertiliser, financing and equipment, which are used in production; second, intermediate activities, such as grading, storage, processing, packaging, distribution, pricing and marketing; and third, final consumption activities, such as restaurants and groceries. The input supply industry, production agriculture and value-added activities are considered the agribusiness core industries. These core industries use the materials and services of certain ancillary industries, which are considered agribusiness support industries [73].

In short, agribusiness is about running all businesses related to agriculture. It creates complex systems that mutually influence one another, including the production, distribution and consumption of food, clothing and even shelter, and all economic activity in the food and fibre system. These systems aim to bring food to the consumer and encompass the input supply industries, agricultural production and post-harvest activities,
and value-added activities such as commodity processing, food manufacturing and food distribution.

Agribusiness Risk

Agribusiness activities include any business related to agriculture, such as farming, animal husbandry, and aqua- or marine-related activities. Therefore, agribusiness risks are very closely related to agriculture risks [47]. Furthermore, agribusiness is a key source of food supplies in the world’s economy [7]. However, the authors state that agribusiness products are always dealing with specific characteristics such as seasonality, supply spikes, and bulkiness or perishability. As agribusiness risks are very closely related to agriculture and agrifood risks, various risks to agribusiness are summarised in Table 4.

Table 4 shows that there are different classifications of risks in agriculture as part of agribusiness. Agriculture risks can be divided into four categories: market/price, production, financial, and legal/institutional risks [47, 75]. The authors explain further that impact levels of each of the risks vary among individuals or households, communities, and nations or regions, as well as according to the scale of risk, namely, micro, meso or macro.

In short, based on various constructs related to supply chain and agribusiness, the construct ASC can be defined as all activities, processes, relationships and information systems that are agricultural business-oriented, that integrate into a network system, and that are connected directly (tangible) or indirectly (intangible) from upstream to downstream, including the coordination and collaboration of processes and activities across different functions (such as marketing, sales, production, product design, procurement, logistics, finance and information technology) within the network of organisations needed to distribute materials and information (including money) into the hands of customers. Meanwhile, according to various constructs related to SCR, agribusiness risk and ASC, the construct ASC risk can be defined as the uncertainty that affects the target or objective in the ASC, defined as all activities, processes, relationships and information systems that are agricultural business-oriented, that integrate into a network system, and that are connected directly (tangible) or indirectly (intangible) from upstream to downstream, including the coordination and collaboration of processes and activities across different functions (such as marketing, sales, production, product design, procurement, logistics, finance and information technology) within the network of organisations needed to distribute materials and information (including money) into the hands of customers.

This section has discussed ASC risk based on several main constructs (supply chain, SCR, ASC, agribusiness and agribusiness risk). However, risks in the ASC need to be

| Author(s) | Agribusiness Risks |
|-----------|--------------------|
| Eremenko et al. (2020) [76] | Types of risks affecting agricultural enterprises (1) Natural risks, (2) Environmental risks, (3) Field loss risks, (4) Inflationary and deflationary risks, (5) Transportation loss risks, (6) Risks of losses during storage of agricultural products, (7) Bankruptcy risks, (8) Selective risks, and (8) Risks of political instability. |
| Chandrasekaran and Raghuram (2014) [47]; OECD (2009) [75] | Risks in agriculture (1) Market/price, (2) Production, (3) Financial, and (4) Legal/Institution. |
| Harwood et al. (1999) [77] | Sources of risk in farming (1) Production or yield, (2) Price or Market, (3) Institutional, (4) Human or personal, and (5) Financial risks. |
| Just and Pope (2002) [78] | Major sources of farm risk (1) Production, (2) Marketing, (3) Financial, (4) Legal and environmental, and (5) Human resources risks. |
| Hardaker et al. (2015) [79] | Types and sources of agriculture risk (1) Production, (2) Price or market, (3) Institutional, (4) Political, (5) Sovereign, (6) Contractual, (7) Human or personal, and (8) Business risks. |
classified to address the second research question. Therefore, the next section will identify and categorise the various risks related to the ASC.

3.2.2. Categorising Risks in the Agribusiness Supply Chain (ASC)

Risks in the ASC can be categorised by referring to the classification of risks in the supply chain and risks in agribusiness, including risks in the agriculture supply chain and agrifood chain. This is because the constructs of agriculture supply chain and agrifood chain are very closely related to each other. The agriculture supply chain or supply chain for agriproducts is a network of organisations involved in a number of processes and activities to meet and satisfy the customer demands [44,80]. Meanwhile, agrifood chains are complex systems involving multiple multifaceted firms, usually working together within specific industry sectors such as grain, beef, wool and dairy, to satisfy an increasingly globalised market demand for high-value food products [81]. These two concepts appear to be similar in several aspects, such as emphasising the aspects of a network of organisations, meeting customer demands and satisfying their needs, and high value of food products. However, they have different characteristics and scopes. For instance, agriculture supply chain is mainly focused on the production stage (supply), while agrifood chain is more focused on the process and demand, including operational, financial, collaboration, information and strategic levels.

Therefore, categorising ASC risk can be based on risk sources in the agriculture supply chain and agrifood chain (see Table 5).

Table 5. Risks in agribusiness supply chain.

| Author(s) | Risks in Agribusiness Supply Chain |
|-----------|-----------------------------------|
| Behzadi, Golnar et al. (2018a) [7]; Nyamah et al. (2017) [14] | Risk sources in agrifood SC |
| Behzadi, Golnar et al. (2018a) [7]; Behzadi, G. et al. (2018b) [16] | Risk management for agriculture SC |
| Chandrasekaran and Raghuram (2014) [47] | Risk management for ASC |
| Behzadi, G. et al. (2018b) [16] | Risks in ASC |
| Behzadi, Golnar et al. (2017) [15] | Sources of uncertainty in ASC |
| Jaffee, Siegel and Andrews (2008) [82] | Major risks facing food and agribusiness firms |
| Peck, cited in Enyinda and Mbah (2017) [69] | Risks in the food supply chain |

Table 5 shows that risks in the ASC can be categorised according to several risk sources, namely, risks in the ASC, risk sources in the agrifood chain, risk management for
the agricultural supply chain, risk management for the ASC, risks in the food supply chain and major risks facing food and agribusiness.

According to Behzadi et al. (2018b) [16], risks in the ASC are divided into two types: supply-side risks, such as weather variability, disease and pests, which affect the quantity and timing of supply, and demand-side risks, which mainly affect market capacity and sales price. These sources of risk are very limited in representing risks in the ASC. Similarly, Peck (cited in [69]) described the sources of risk in the food supply chain as product contamination and recall; loss of access such as terrorism; loss of access (protesters), site, people and supplier; reduced capacity; contractual cover; dual sourcing; and market force. These risk sources are dependent on research aims and scopes.

However, several articles have provided clear limits on the sources of risk related to the ASC, namely, weather, biological/environment (e.g., excess rainfall, pests, and disease), logistical/infrastructure, market including demand and supply (e.g., labour shortage and volatile customer demand), policy/regulation (e.g., periodic change in interest/exchange rate policies, uncertain land policies/tenure and political-related issues), financial, and operational/managerial factors.

### Sustainability in the Agribusiness Supply Chain

Studies related to sustainability in the ASC have become one of the main concerns of organisations. This is in line with Abdel-Basset and Mohamed (2020) [83], who state that organisations are more concerned with environmental and social outcomes, as well as economic and financial aspects, nowadays to maintain a sustainable supply chain. Moreover, the authors point out that with the development of knowledge about impacts to achieve sustainable goals, sustainable supply chain management has become a major interest in recent years. Besides, it is important to consider SC sustainability by paying attention to sustainability risks to ensure a sustainable business future. For instance, environmentally unsustainable business practices will ultimately cause financial losses for companies [84,85]. Conversely, economic deprivation through lack of economic development leads to numerous negative social impacts associated with poverty, including hunger; inadequate housing; poor education; declining physical and psychological health; and increased human conflict, crime and violence [85]. Moreover, another important issue has been raised by researchers related to supplier sustainability risks [86]. Herein, the authors emphasise that purchasing and supply management (PSM) plays an important role in the mitigation of sustainability-related risks. Therefore, by conducting responsible PSM, the risk of corporate reputational damage to the buying firm, caused by supplier misconduct, can be avoided.

In summary, according to various categorisation of risks, risks in ASC can be divided into three: internal, external and network risks. Then, these risks can be categorised into three risk sources or risk factors, namely, organisational, environmental and network-related risk factors [33,56,60–62,68,69]. There are five organisational risk factors: supply, demand, process and control, logistical/infrastructural and financial-side risks. Environmental risk factors consist of two, namely, man-made risks and natural disruptions. Meanwhile, network-related risk factors consist of collaboration-side risks. This is clearly illustrated in Table 6 and Figure 6 regarding risk categories and risk factors exposure to ASC. Figure 6 describes a taxonomy of risk in ASC that is closely related to ASC activities that involve movement and coordination of material, information and financial flows, from raw materials, to suppliers to end users.
| Risk Categories | Risk Factors/Risk Sources Exposure to Agribusiness Supply Chain |
|----------------|----------------------------------------------------------------|
| 1. Internal risks (Organisational risk factors) | 1.1. Supply-side risks.  
1.1.1. Price change.  
1.1.2. Quality issues.  
1.1.3. Supplier’s bankruptcy.  
1.1.4. Supplier sustainability risks.  
1.1.5. Conflicts in goals.  
1.1.6. Inventory problem.  
1.1.7. Delays.  
1.1.8. Product complexity.  
1.1.9. Problem in technology access.  
1.1.10. Human resources or personal issues. |
| 1.1.2. Demand-side risks. | 1.2. Delays.  
1.2.2. Laziness in new product development.  
1.2.3. Wrong forecasting.  
1.2.4. Variation in demand.  
1.2.5. Inaccurate information.  
1.2.6. Input market uncertainties.  
1.2.7. Product market uncertainties.  
1.2.8. Competitive uncertainties. |
| 1.3. Process and control side risks. | 1.3. Inefficiency in the manufacturing process.  
1.3.2. High level of changing in the process.  
1.3.3. Material shortage.  
1.3.4. Outdated technology. |
| 1.4. Logistical/infrastructural side risks. | 1.4.1. Material flow risks. |
| 1.5. Financial-side risks. | 1.5.1. Exchange rate risk.  
1.5.2. Price and cost risk.  
1.5.3. Financial strength of supply chain partners.  
1.5.4. Financial handling/practice. |
| 2. External risks (Environmental risk factors) | 2.1. Man-made risks.  
2.1.1. Policy/regulation.  
2.1.1.1. Change in local policy/regulation.  
2.1.1.2. Change in regional/national policy/regulation.  
2.1.1.3. Periodic change in interest/exchange rate policies.  
2.1.1.4. Uncertain land policies/tenure.  
2.1.1.5. Political-related issues.  
2.1.2. Events-related disasters.  
2.1.2.1. Work accidents  
2.1.2.2. Theft |
| 2.2. Natural disruptions. | 2.2.1. Weather-related disasters (excess rainfalls, floods, landslides and earthquakes).  
2.2.2. Pests and diseases. |
| 3. Network risks (Network-related risk factors) | 3.1. Collaboration-side risks.  
3.1.1. Information flow (e.g., level of information accuracy, information system security and disruption).  
3.1.2. Coordinating supply and demand (e.g., lack of ability to support the operations; lack of trust; intellectual property; and information outsourcing). |
3.2.3. Understanding How Risks Affect Agribusiness Supply Chain Performance

Agribusiness activities are always associated with risk and uncertainty because, first, risk and uncertainty play a fundamentally important role in most supply chains and agribusiness firms and, second, agribusiness activities are directly dependent on natural, climatic and geographic processes and are thus subject to various types of risk [76].

According to Misra and Lence (2005) [87], risk is uncertainty that affects an individual’s welfare and is often associated with difficulties and losses by a firm, as well as its survival as a business. Risk occurs because people never know what will happen in the future, and risks come in many different forms. Risks can arise at any time in the supply chain, from initial suppliers to end customers, and those risks can disrupt material supply or product demand [88]. For instance, product shipments to customers may be delayed because transportation is delayed, products are damaged in storage warehouses, products are attacked by pests or farmers become ill. This condition can threaten the entire agribusiness operations. Even though they may use the best estimates and do every possible analysis, there is always uncertainty about future events. It is this uncertainty that carries risk. Knight (1921) [89] termed the risk caused by uncertainty as unmeasurable uncertainty, while risk itself has been understood as measurable uncertainty. The author explains that risk can be measured through the distribution of the outcome in a group of instances by calculating a priori or from statistics of past experience, while in the case of uncertainty this is not true. If the distribution of possible outcomes in a group of instances is known, it is possible to dispose of any real uncertainty by expedient grouping or consolidating of instances, but that it is possible does not necessarily mean that it will be done [89].
Risk is the uncertainty that affects the target or objective, or the effect of uncertainty on objectives \[89,90\]. It is explained further that an effect can be defined as a deviation from the expected, and it can be positive, negative or both, and it can address, create or result in opportunities and threats. Besides, risk is usually expressed in terms of risk sources, potential events, their consequences and their likelihood \[91,92\].

Jüttner, Peck and Christopher (2003) \[56\] state that risk sources are the environmental, organisational or supply chain-related variables that cannot be predicted with certainty and that affect the supply chain outcome variables. Meanwhile, risk consequences are the focused supply chain outcome variables such as costs or quality (i.e., the different forms in which the variance becomes manifest).

Handling risk can be carried out with risk management through mitigating the likelihood of occurrence or mitigating the likelihood of the impact occurring, or both. Although risk has uncertain consequences, which may not be economically beneficial \[47\], cause difficulties or loss, affect wellbeing \[77\] and be unavoidable, the risk itself is something that can be managed \[93\]. Since risk has been understood as “measurable uncertainty” \[89\], many researchers from different disciplines have developed methods and analysis tools to measure risk in their field of study \[37,94–97\]. In the agricultural sector, for instance, farmers’ risk preferences have been measured in the European agricultural context \[98\]; RADARSAT-2 is being used to monitor soil moisture to support risk reduction for the agriculture sector \[99\]; a TAMSAT-ALERT system is providing early warnings on meteorological risk to agriculture \[100\]; satellite-based meteorological and agricultural drought monitoring is available for agricultural sustainability in Sri Lanka \[101\]; and there are new perspectives on measurement, modelling, development and policies related to the income of farm families in Europe, especially in the light of increasing complexity of farms and policies on risk exposure \[102\]. Although researchers have developed either new operational frameworks or new perspectives on modelling to measure risks in agricultural sector, they have emphasised the crucial role of risk management in the agricultural sector \[98–103\]. For instance, to better understand farmers’ responses to risks and potential adoption of risk management tools, effective risk exposure at farm and farm-household levels, as well as risk perception and preferences, need to be considered \[102\]. Therefore, it is crucial to have a comprehensive understanding of all processes of the risk management system, and the system should address the different sources of risk that affect the ASC and mitigation strategies to manage them.

Supply chain management is essential to manage operational activities and flows within and throughout the supply chain. This is because supply chain management supports supply chain orientation and involves proactively managing the two-way movement and coordination of goods, services, information and funds (i.e., multiple flows) from raw materials to end users \[40\].

SCRM plays a vital role in agribusiness operations, effectively in the presence of a variety of uncertainties. Over the last two decades, many researchers have focused on SCRM by contributing to the areas of defining, operationalising and mitigating risks \[19\]. Hence, there is a need to categorise various kinds of studies and explore the common trends of the study area. Although the research related to SCRM has been growing over the last two decades, it is still a fairly new field of research, and studies related to the topic are scarce \[59,104\]. Accordingly, defining and categorising risks in the ASC are crucial and should be carried out to manage and improve performance in agribusiness operations.

4. Discussion

4.1. Risk Categories and Risk Factors Exposure in the Agribusiness Supply Chain

Categorisation of ASC risk was carried out according to the various types and categories of risk proposed by researchers \[7,47,56,60–62,68\] in their respective field of study, particularly related to the SCR context (see Table 3), agribusiness risk (see Table 4) and ASC risk (see Table 5). Accordingly, ASC risks can be divided into three categories (in-
ternal, external and network risks), which encompass three risk factors (organisational, environmental and network-related risk factors) (see Table 6).

It is essential to investigate risks in the ASC that exist both inside and outside the organisation. Farmers may lack managerial skills in managing their agriculture businesses as they may have limitations in terms of education level, knowledge, skills and technology. Further, farmers may face various risks related to the environment (e.g., unpredictable weather; polluted soil, water and air; pests; and diseases), economy (e.g., unstable prices; availability of labour, vegetation and yields), and social situation (health disturbances of farmers and others) [105–108]. Accordingly, risk management must begin by grouping risks both from inside and outside to facilitate risk management [109].

4.1.1. Internal Risks

Internal risks are related to operational risks from the internal organisation of the business. Andersen and Schrøder (2010) [110] stated that operational risk sources mostly come from inside organisations, and their handling varies significantly according to the type of operation. They also pointed out that these risks can be positive or negative, and that risk mitigation must take place internally, whether preventive or protective, because the risk source comes from inside the organisation. Risk mitigation, for example, is related to the risk of disruption to production uncertainties (e.g., machine failure) [56], violations of the company’s code of ethics, and administrative errors and lawsuits [109,111]. However, in this paper internal risks that encompass organisational risk factors are divided into five sources of risk: supply, demand, process and control, logistical/infrastructural, and financial-side risks [16,34,39,47–49,57,59,75].

Supply-side risks include price changes, quality issues, supplier bankruptcy, supplier sustainability risks, conflicts in goals, inventory problems, delays, product complexity, problems in technology access, and human resources or personal issues [7,44,49,59,75,77,86,112,113]. These include fluctuations in product price, low quality of product, farmers going bankrupt, farmers unable to achieve the production targets required by companies, lack of product inventory on the farm, farmer delays in supplying products, farmers not understanding product characteristics such as seasonality and perishability, farmers not understanding how to access information through the internet, and farmers not understanding how to access inputs such as fertilisers and pharmaceuticals for their farms. Agribusiness may also be affected by personal risks of individuals such as owners, family members and employees [78]. For example, the existence of a business may be threatened by the death of an owner or the divorce of a couple that owns a farm in partnership. Prolonged illness of one of the principals may reduce production or raise costs in an agribusiness. A careless farmer or farm worker may mishandle livestock or misuse machinery, resulting in losses or injuries [79].

Demand-side risks include delays, laziness in new product development, wrong forecasting, variation in demand, inaccurate information, input market uncertainties, product market uncertainties and competitive uncertainties [7,44,49,59,75,77,112,113]. Examples of these are companies delaying products from farmers; companies not creating new products that benefit farmers, local governments and other actors; companies providing wrong forecasting to farmers after selling the product, such as product price, number of products, and revenue; companies requiring varying amounts of farmers’ products because of the quality and quantity of their products; companies providing inaccurate information to farmers that affects their business; uncertainties of the input market that influence farmers in managing their farms; uncertainties of the product market that affect total demand, price of the product and the income of farmers; and farmers not understanding business competition.

Process and control side risks include inefficiency in the manufacturing process, high levels of change in the process, material shortages and outdated technology [44,49,112,113]. Examples include use of outdated machinery in the manufacturing process, defective products that affect the total revenue received by farmers and companies, poor post-harvest
handling, depreciation of products, depreciation of equipment, lack of farm maintenance, lack of raw materials in the manufacturing process, and farmers managing their farms using traditional ways and simple equipment.

Logistical/infrastructural related risks include material flow risks [36,39,49,59,112,114], such as the inability to increase or reduce the amount of production quickly, and long supply lead times from farmers to companies.

Financial risks include exchange rate risks, price and cost risks, the financial strength of supply chain partners, and financial handling/practices [36,49,75,77,109]. Examples include fluctuations or changes in interest rates; farmers taking out business loans from cooperatives with high interest rates; high production costs of inputs such as labour, fertiliser and agricultural pharmaceuticals; high transportation costs such as transportation cost from the farm to a processing factory; farmers having limited access to credit provided by financial institutions; and low changes in income from farms and in the value of financial assets.

4.1.2. External Risks

The external risks are the risks derived from sources outside the supply chain, over which an organisation has little or no control, such as natural disasters (e.g., earthquakes, hurricanes and tsunamis), war, oil crises, terrorist attacks, outbreaks of disease, financial irregularities, crime and rising custom duty [36]. According to Andersen and Schrøder (2010) [110], risk management is used by organisations to deal with hazards and economic risks that, because of the sources of risk, generally come from outside the organisation and have a negative impact. Examples include natural disasters such as earthquakes and floods, and disasters caused by human activities such as forest burning, air pollution, theft, terrorism and work accidents. Other risk instances may originate from economic aspects such as fluctuations in prices of agricultural products, unstable interest rates, and changes in demand or supply of goods [109].

However, in the agribusiness context, external risks that signify environmental risk factors can be divided into two types: man-made risks and natural disruptions [49,56,59,68,107,110,115].

a. Man-made risks include policy/regulation and events-related disasters. Policy/regulation risks include changes in local policy/regulation; changes in regional/national policy/regulation; periodic changes in interest/exchange rate policies; uncertain land policies/tenure; political issues [47,84,110]; customary land ownership; program schemes of companies that affect local communities; high investment climate, particularly for plantation crops; conversion of forest into plantation crops; stealing of plantation land; and claims for land compensation by customary rights owners. Meanwhile, events-related disasters consist of work accidents and theft [36,47,110,115], for instance, work accidents that pose a risk to company performance and theft of products on the farms that have a significant impact on the profits obtained.

b. Natural disruptions include weather-related disasters such as excess rainfall, floods, landslides and earthquakes, and pests and disease [36,47,110].

4.1.3. Network Risks

Network risks indicate network-related risk factors, including collaboration-related risks such as information flow and coordinating supply and demand [36,49,56,68,116]. These authors also explain that information flow includes the level of information accuracy, and information system security and disruption, while coordinating supply and demand includes lack of ability to support the operations, lack of trust, intellectual property and information outsourcing. For example, there may be a lack of trust, lack of legal documentation and lack of ability to support agribusiness operations among supply chain actors.
4.2. Future Research Directions

This paper recommends several essential future research directions that can be classified into two main themes: risks and sustainability in the ASC and resilience in the ASC.

4.2.1. Risks and Sustainability in the Agribusiness Supply Chain

There is a shortage of empirical research in ASC risk. Figure 3 shows ASC risk among the lowest proportions of articles used to define and categorise risk in the ASC. Further, as can be seen from Figures 3 and 4, no publication addressed ASC risk for almost two decades. Therefore, it is essential to conduct case studies based on empirical studies to determine current ASC risk, such as investigating the effectiveness of contract farming to overcome risk and uncertainty in the ASC [117], food losses and wastes [118], the impact of coordination (horizontal and vertical) on value creation [119], and the sustainability risk of the ASC by considering the aspects and dimensions of its sustainability [86,120–122].

4.2.2. Resilience in the Agribusiness Supply Chain

ASCs are sensitive to various sources of uncertainty and have become a crucial issue for many firms today. For the pandemic-affected agribusiness actors, it is essential to strengthen their productivity, competitiveness and adaptive capacities by conducting research on the resilience of production, supply chain and agribusiness systems. Besides, there is a need to perform further research focusing on long-term strategies, innovative policies, legal instruments and institutional arrangements [123]. For instance, future research may focus on network thinking, which can be instrumental in understanding adaptation constraints in a systematic way and can be used to inform interventions to improve network dynamics for the benefit of MSMEs’ adaptive capacity [116,124]. In addition, investigations may focus on blockchain technology as a big opportunity in agricultural business and agrifood supply chains in the digital economy [125]. Another area includes the use of blockchain by small farmers in the agrifood sector as an alternative during the COVID-19 pandemic [126]. Accordingly, creating more resilient supply chains is essential to manage and mitigate various risks in today’s business [112,116,127,128].

5. Conclusions

Risk in the ASC has become a central business problem worldwide. The current trend of globalisation has affected every business, including both individual and corporate entities, and the SCR has become a significant concern in logistics and other business processes. To address these issues, various studies have been performed related to risk in various contexts, such as risk in the agrifood supply chain, ASC risk management, disruption of the ASC, risk assessment of the agriculture supply chain, sources of risk facing the ASC and manufacturing risks. However, existing research has not defined and categorised risks in the ASC as a basis to manage risks in the ASC. Therefore, the definition and categorisation of risks in the ASC has been overlooked. Sixty-one articles from six databases published between 2000 and 2020 were subjected to descriptive and thematic analysis. Thus, this paper undertakes an SLR to develop a novel taxonomy for ASC risk categorisation and to identify future research directions by reviewing the extant literature on the topic.

From a thorough review of literature, it is found that there has been no clear definition and categorisation of risks in the ASC for almost two decades, and this research fills the gap in the extant literature by making an incremental step in defining and categorising the ASC risks. Herein, ASC risk is defined as the uncertainty that affects the target or objective in the ASC. The ASC includes all activities, processes, relationships and information systems that are agricultural business-oriented, integrate into a network system and are connected directly (tangibly) or indirectly (intangibly) from upstream to downstream (including the coordination and collaboration of processes and activities across different functions, such as marketing, sales, production, product design, procurement, logistics, finance and information technology, within the network of organisations) to distribute materials and
information (including money) into the hands of customers. ASC risk can be divided into three categories (internal, external and network risks), which cover eight risk sources or risk factors (supply, demand, process and control, logistical/infrastructural, financial, man-made, natural disruptions and collaboration-side risks). This SLR paper recommends two essential future research directions: risks and sustainability in the ASC and resilience in the ASC.

Although this study follows a systematic approach, it has certain limitations. First, only WoS and Scopus were used for primary database searches, while other databases, including Emerald Insight, Science Direct, Taylor and Francis, and Google Scholar, were used as secondary sources for further confirmation. Even though WoS and Scopus provide comprehensive platforms that allow researchers and other users to track ideas across disciplines, there are other databases that can be used. Second, although this review has used peer-reviewed articles, books and conference papers, there are other sources such as reports, trade journals, theses and books that may be significant sources of knowledge on the current topic. Finally, although the focus of this review was on defining and categorising ASC risk, it does not mean that all aspects of ASC risk are fully understood by the research community.

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