

Article

Enterprise Risk Management: A Literature Review and Agenda for Future Research

Sorin Gabriel Anton *  and Anca Elena Afloarei Nucu

Faculty of Economics and Business Administration, Finance, Money, and Public Administration Department, Alexandru Ioan Cuza University of Iasi, Carol I Avenue, No. 11, 700505 Iasi, Romania; anca.afloarei.nucu@uaic.ro

* Correspondence: sorin.anton@uaic.ro; Tel.: +40-232-201-450

Received: 18 October 2020; Accepted: 12 November 2020; Published: 14 November 2020



Abstract: The Enterprise Risk Management (ERM) process has heterogeneously developed across the world, although it represents a leading paradigm, supporting organizations to identify, evaluate, and manage risks at the enterprise level. Academics have studied the process, but there is no complete picture of the determinants and implications of such an integrated risk management process. Therefore, we present a systematic empirical literature review on ERM, based on a research protocol. The review highlights that the ERM literature can be divided into four general lines of research: the ERM adoption, the determinants of the ERM implementation, the effects of ERM adoption, and other aspects. In contrast to the richness of studies devoted to ERM engagement in small and medium-sized enterprises (SMEs), studies exploring ERM adoption in banks or insurance are relatively few. The literature review has revealed that the most frequently investigated effect of ERM is on firm performance. Little effort has been dedicated to the analysis of the effectiveness of ERM by its components and to institutional, individual, and organizational factors that affect ERM adoption. The study can serve as a starting point for scholars to explore research gaps related to ERM, while the practitioners can rely on the presented findings to identify the effects of the ERM implementation.

Keywords: Enterprise Risk Management; research agenda; systematic review

1. Introduction

ERM represents a leading paradigm, supporting organizations to identify, evaluate, and manage risks at the enterprise level. According to Khan et al. (2016), several factors motivate firms to engage in the ERM process, as follows: the probability of financial distress and associated costs, the low earnings performance, the growth opportunities, and the independence of the board. Also, a proper risk management strategy can become in competitive advantage supporting firms to grow (Blanco-Mesa et al. 2019). This explains the vast body of research dedicated to ERM. The purpose of the paper is to perform a literature review of the empirical evidence on ERM and to propose future research directions.

In line with Tranfield et al. (2003) and Prasad et al. (2018), the paper employs a systematic literature review as a research methodology, by performing several steps (Snyder 2019; Grilli et al. 2019), as follows: identify research evidence and selection of studies; description and classification of chosen articles; detailed content analysis of selected research papers, and reporting of results and future research agenda. The analyzed sample is represented by the ERM literature produced between 2008 and 2019 and indexed in the ISI Web of Science database.

The motivation of performing a literature review is based on the increasing importance of ERM, as a leading paradigm for strong corporate governance, and the topic may be of interest for organizations that are implementing ERM, researchers because the article can serve as a reference point in the field,

and practitioners desiring to be updated on the process considering findings and perspectives from the empirical analysis. The ERM engagement offers an overall connection between risk management, business strategy, objective-setting, and decision making (Arena et al. 2010), therefore explaining the rich literature developed in the field. The sample of literature used in this study leads us to draw a picture of the adoption of corporate risk management at the territorial and the sectorial level. The implementation of ERM programs has gained importance in different domains: banks, insurance, and non-financial firms, especially SMEs. The developed economies, especially the US, are the most productive countries in terms of empirical evidence on ERM implementation and effects at the firm level. Other geographical areas (e.g., European countries) are gaining momentum, mainly because of the increasing internationalization trend in the domain.

To the best of our knowledge, a detailed literature review on ERM is rare. During the analyzed period, we identified four published reviews on ERM, by Bromiley et al. (2015), Wu et al. (2015), Tworek (2016), and Liff and Wahlstrom (2018). Among these research works, the review of Bromiley et al. (2015) from Long Range Planning journal is the most cited one with 102 citations from Web of Science Core Collection. Our review differs from these in several ways. First of all, the analysis includes the most recently published pool of articles, covering a longer period (2008–2019). Second, contrary to the previous papers, we performed a citation-based analysis of selected articles to highlight the most influential papers on ERM. Third, unlike Bromiley et al. (2015), this review does not aim to look for the conceptual roots of ERM and how management scholars can contribute to ERM research. Rather, the objective is to review the state-of-the-art empirical literature and subsequently to propose future research directions on ERM.

The paper brings significant contributions to the academic literature. Firstly, it offers a complete picture of a detailed systematic review of the published research on ERM, based on the recent pool of articles in the field. It presents a comprehensive citation-based analysis and a content analysis of the sample studies under different themes, countries studied, and industries analyzed. Overall, the empirical literature on ERM can be divided into four broad categories:

- The ERM implementation
- The determinants of the ERM adoption
- The effectiveness of the ERM process
- Other aspects of ERM, such as ERM across domains, ERM strategies, ERM maturity, the impact of institutional context on ERM adoption, ERM adoption in family firms, and ERM as a moderating factor between different variables.

Moreover, building on the review, the paper proposes a future research agenda on ERM. Secondly, the paper offers information about the prospective sources of publishing studies on ERM to academics. Thirdly, this article offers some guidelines to researchers interested in employing the literature review as a research methodology. Fourthly, the paper represents a valuable reference for science development, because it helps scholars understand the research themes of publications, see the most influential countries and authors, and explore the future trends of the research in ERM. This paper supports the understanding of the development of the ERM domain and the readers can explore the publications' structure and the development trend of the ERM. The study brings reference value for scholars in the field. First, it can serve as a starting point to explore research gaps related to ERM based on our findings and future research directions. Secondly, the practitioners can rely on the presented findings to identify the effects of ERM implementation. They can identify whether an effect is constant across countries or industries or what are the sample characteristics that influence ERM implementation.

The remainder of the paper is organized as follows. Section 2 describes the methodology. Section 3 presents the citation-based analysis of the selected pool of articles and lists down the most cited papers and journals on ERM. The content analysis of various ERM themes is discussed in Section 4. Section 5 brings the directions for future research, while Section 6 concludes the study.

2. Methodology

The literature review has three coordinates: to identify all the scientific studies published to date on ERM adoption and its effects; to assess the current state of the academic literature; to propose new directions for future research. The research question this review is addressing is as follows: “What are the latest theoretical and empirical advances in research on ERM adoption and implications?”

In order to find the answer, we consider the literature produced from the year 2008 until 2019, since from 2008, the research on ERM shows an outstanding development. Figure 1 presents the number of publications on ERM, by publication years and it can be observed that starting from 2008, there is increased popularity of studies related to ERM.

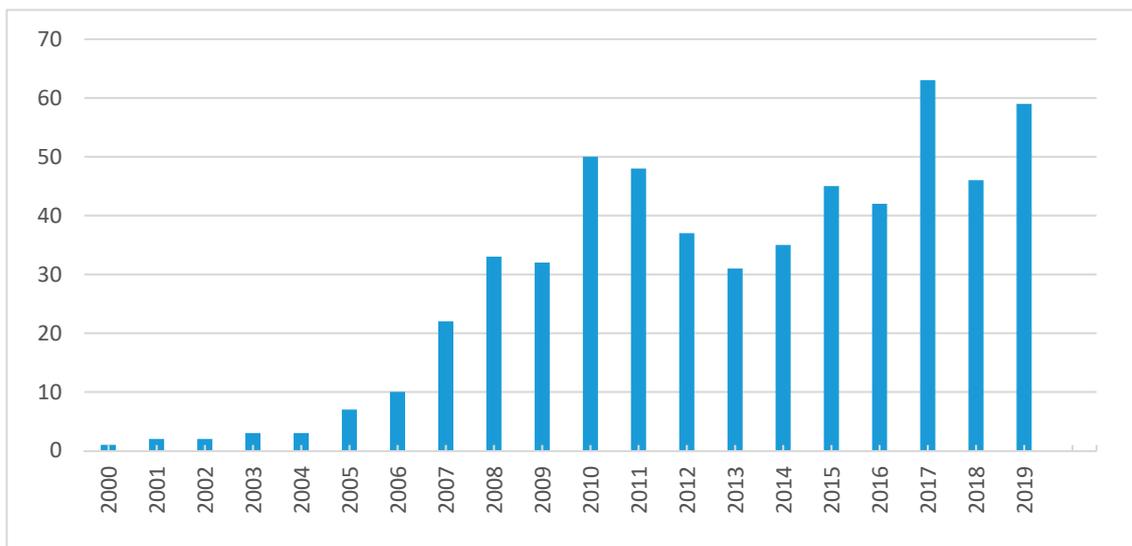


Figure 1. Results of ISI Web of Science search for “Enterprise Risk Management” in the title for the period 2000–2019 (number of publications). Source: Web of Science database

The search for articles took place in August 2020. In line with the guidelines of the literature review as a research methodology, we conducted a systematic literature review (Tranfield et al. 2003; Prasad et al. 2018), by performing several steps (Snyder 2019; Grilli et al. 2019).

Figure 2 describes the four steps of the systematic literature review, together with the guidelines we considered to ensure a well-conducted review.

In line with other studies (Huang et al. 2016; Abideen et al. 2020), we initiated the review process by searching for the literature on ERM in ISI Web of Science, an international bibliographic database that contains high rated journals, based on a keyword search, by using the terms “Enterprise Risk Management”, “ERM”, and other keywords such as “integrated risk management”, “ERM adoption”, “ERM implementation”. After the preliminary search, an initial pool of 521 unique contributions yielded, including peer-reviewed journal articles, proceedings papers, books and book chapters, and other materials (editorial materials, book review, and reviews). Table 1 provides an overview of the initial search results, by document type.

Table 1. The breakdown by the document type of the initial pool of contributions on ERM for the period 2008–2019.

Document Type	Number of Research Works	% of the Total
Article	191	36.7%
Proceedings paper	259	49.7%
Book chapter	44	8.4%
Editorial material	11	2.1%

Table 1. Cont.

Document Type	Number of Research Works	% of the Total
Book	5	1.0%
Review	4	0.8%
Book review	5	1.0%
Meeting abstract	1	0.2%
Early access	1	0.2%
Total	521	100%

Source: Web of Science database.

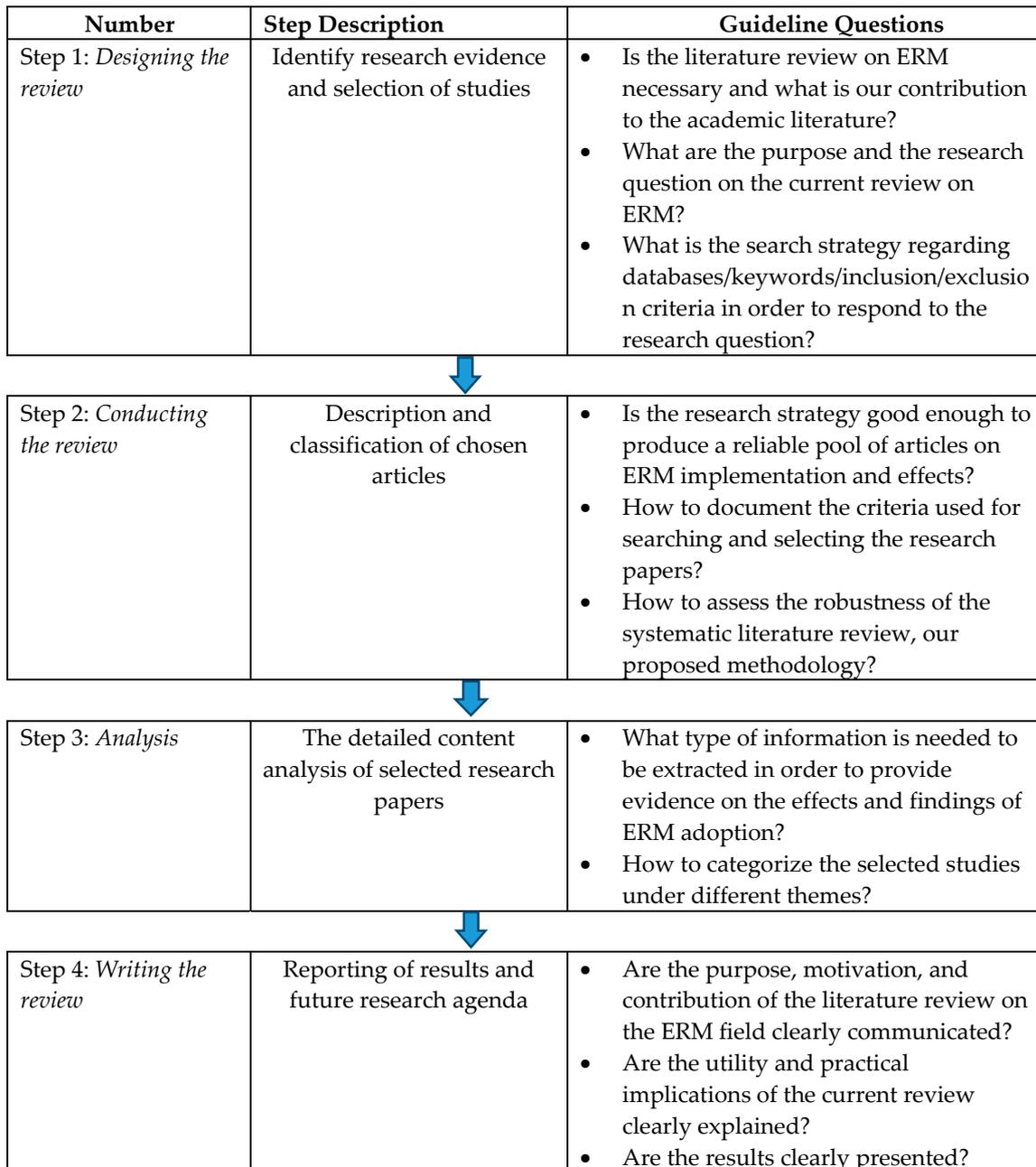


Figure 2. Systematic Literature Review—steps and guideline questions. Source: Adapted from Snyder (2019) and Prasad et al. (2018).

In the second step, we sorted out the initially obtained works, based on the purpose of the research and exclusion criteria. We decided on the exclusion criteria from the perspective of research quality. We excluded proceedings papers because they illustrate a trade-off between quality and attainability, books and book chapters since it is out of our scope to carry out the process of a book review, and other document types such as editorial materials, meeting abstracts, and reviews. This step of sorting was conducted on a sample of 191 papers. After a preliminary screening of the abstract of the emergent articles, we eliminated those that do not fall under the research question. Therefore, the final sample contains 101 impactful articles, and it is free from criticism regarding research quality. Table 2 offers a detailed view of the inclusion criteria for the current literature review.

Table 2. Inclusion Criteria for the Systematic Literature Review.

Inclusion Criteria	Brief Description
Empirical studies	Choose all articles that provide a qualitative and quantitative perspective on ERM, by advancing knowledge on the topic.
Geographical dimension	Include all studies that provide new evidence on ERM adoption and implementation for firms active in specific geographical regions or countries.
Domain of activity	Include all studies that provide new evidence on ERM adoption and implementation for firms active in specific domains.

After selecting the final sample, the third step consists of deciding how selected articles are used to perform an analysis and what type of information is needed to fulfill the purpose of the current literature review. In our paper, we make use of descriptive information, such as authors, years published, topic, and respectively, in the form of effects and findings of ERM adoption, both from geographical dimension and different sectors of activity.

The final step consists of writing the review and, based on reported findings, setting further research agenda.

3. Citation-Based Analysis

The top 10 Web of Science categories, according to the number of articles on ERM published, are as follows: Business Finance, Economics, Management, Business, Engineering Industrial, Operations Research Management Science, Engineering Civil, Social Sciences Interdisciplinary, Public Administration, and Engineering manufacturing. Therefore, it can be noticed that the research on ERM is interdisciplinary.

We analyze the selected sample of articles from two perspectives: the most cited studies on ERM, according to Web of Science Core Collection, and respectively, journals that publish papers more in quantity (number of studies published) and more impactful (high average citation). Table 3 presents the list of journals that have published more than two articles on ERM in descending order according to the number of articles published, over the period 2008–2019. Besides the 30 journals listed in Table 3, 71 other journals have published only one article, but are not reported here in order to preserve space. According to the Average Number of Citations from Web of Science Core Collection, the Accounting Organizations and Society has received the highest citations per paper (86 citations) followed by the International Journal of Production Research (85 citations). Also, it can be noticed that, despite the greater number of articles published on ERM, the number of papers per journal is quite low. A similar finding is reported by Prasad et al. (2018) for another field—working capital management.

Table 4 shows the selected impactful papers in descending order of their citations received from the Web of Science Core Collection, together with their respective years of publication and journals.

Table 3. The first 30 Source Titles (by record count).

Serial Number	Title of the Journal	Number of Article(s)	Average Number of Citations from the Web of Science Core Collection
1	Journal of Risk and Insurance	10	34
2	Actual Problems of Economics	10	0
3	Managing Risk and Performance a Guide for Government Decision Makers	5	0
4	Engineering Construction and Architectural Management	4	12
5	Risk Management an International Journal	4	5
6	Journal of Construction Engineering and Management	4	38
7	Journal of Risk Research	6	15
8	Accounting Finance Sustainability Governance Fraud Theory and Application	3	1
9	Computational Risk Management	3	1
10	Corporate Risk Management for International Business	3	1
11	Journal of Risk Finance	3	11
12	Management Decision	3	11
13	Accounting Organizations and Society	2	86
14	British Accounting Review	2	26
15	Contemporary Accounting Research	2	39
16	Geneva Papers on Risk and Insurance Issues and Practice	2	13
17	Ekoloji	2	0
18	European Journal of Finance	2	12
19	IBM Journal of Research and Development	2	2
20	International Journal of Accounting and Information Management	2	5
21	International Journal of Production Research	2	85
22	Journal of Applied Corporate Finance	2	13
23	Journal of Banking Finance	2	24
24	Journal of Management in Engineering	2	20
25	Production Planning Control	2	33
26	Mathematical Problems in Engineering	2	10
27	Quantitative Financial Risk Management	2	1
28	Risk Management and Corporate Sustainability in Aviation	2	0
29	Sustainability	2	2
30	Transportation Research Record	2	1

Source: Web of Science database.

Table 4. Top 20 studies on ERM in descending order of their citations.

No.	Title of the Paper and Author(s)	Number of Citations	Year of Publication	Journal
1	The value of enterprise risk management—Hoyt, R.; Liebenberg, A.	191	2011	Journal of Risk and Insurance
2	Enterprise risk management and firm performance: A contingency perspective—Gordon, L. A.; Loeb, M. P.; Tseng, C.-Y.	157	2009	Journal of Accounting and Public Policy
3	The value of non-financial information in small and medium-sized enterprise risk management—Altman, E. I.; Sabato, G.; Wilson, N.	135	2010	Journal of Credit Risk
4	The organizational dynamics of Enterprise Risk Management—Arena, M.; Arnaboldi, M.; Azzone, G.	130	2010	Accounting Organizations and Society
5	Enterprise risk management: a DEA VaR approach in vendor selection—Wu, D. D.; Olson, D.	123	2010c	International Journal of Production Research
6	Enterprise risk management: coping with model risk in a large bank—Wu, D.; Olson, D. L.	98	2010b	Journal of The Operational Research Society
7	Enterprise Risk Management Program Quality: Determinants, Value Relevance, and the Financial Crisis—Baxter, R.; Bedard, J. C.; Hoitash, R.; Yezegel, A.	67	2013	Contemporary Accounting Research
8	A review of enterprise risk management in supply chain—Olson, D. L.; Wu, D. D.	67	2010a	Kybernetes
9	The Adoption and Design of Enterprise Risk Management Practices: An Empirical Study—Paape, L.; Spekle, R. F.	66	2012	European Accounting Review
10	Management of financial risks in Slovak enterprises using regression analysis—Valaskova, K.; Kliestik, T.; Kovacova, M.	51	2018	Oeconomia Copernicana
11	Managing uncertainty—an empirical analysis of supply chain risk management in small and medium-sized enterprises—Thun, J.-H.; Drueke, M.; Hoenig, D.	50	2011	International Journal of Production Research
12	Enterprise risk management: small business scorecard analysis—Wu, D. D.; Olson, D. L.	50	2009	Production Planning & Control
13	Developing Fuzzy Enterprise Risk Management Maturity Model for Construction Firms—Zhao, X.; Hwang, B.-G.; Low, S. P.	47	2013	Journal of Construction Engineering and Management
14	The Valuation Implications of Enterprise Risk Management Maturity—Farrell, M.; Gallagher, R.	45	2015	Journal of Risk and Insurance
15	The Value of Investing in Enterprise Risk Management—Grace, M. F.; Leverty, J. T.; Phillips, R. D.; Shimi, P.	45	2015	Journal of Risk and Insurance

Table 4. *Cont.*

No.	Title of the Paper and Author(s)	Number of Citations	Year of Publication	Journal
16	Enterprise risk management and firm performance: The Italian case—Florio, C.; Leoni, G.	42	2017	British Accounting Review
17	The impact of enterprise risk management on the marginal cost of reducing risk: Evidence from the insurance industry—Eckles, D. L.; Hoyt, R. E.; Miller, S. M.	39	2014	Journal of Banking & Finance
18	Investigating Enterprise Risk Management Maturity in Construction Firms—Zhao, X.; Hwang, B.-G.; Low, S. P.	38	2014	Journal of Construction Engineering and Management
19	A maturity model for enterprise risk management—Oliva, F. L.	34	2016	International Journal of Production Economics
20	Enterprise risk management in SMEs: Towards a structural model—Brustbauer, J.	31	2016	International Small Business Journal-Researching Entrepreneurship

Source: Web of Science database.

According to data presented above, the Journal of Risk and Insurance has received from Web of Science Core Collection the highest citations per paper (191 citations for the article “The value of Enterprise Risk Management”, written by Hoyt and Liebenberg (2011)), followed by Journal of Accounting and Public Policy with 157 citations for the article entitled “Enterprise risk management and firm performance: A contingency perspective”. The results show that Hoyt and Liebenberg (2011) are the most influential authors given the high average citations per article. The paper of Hoyt and Liebenberg (2011) is among the first that analyzes milestone topics related to ERM (ERM determinants and ERM effects on firm value) and therefore, it became a highly influential paper. The authors highlight a positive association between firm value and ERM adoption, a topic that was extensively analyzed by subsequent studies. However, if we consider the number of citations of all the five papers published on ERM, Wu and Olson are the most productive and influential authors.

It can be noticed that most influential papers have, as topics, the relationship between ERM programs and firm value, the extent to which firms have implemented ERM programs, and the implications of ERM adoption. Also, the remaining most cited papers consider ERM in certain fields of activity or certain countries. The most productive and influential country remains the US, with a lot of pioneer work in the field of ERM being documented on the example of US financial and non-financial firms. The most recent study listed in the table was published in 2018 and received 51 citations. This highlights that the research on ERM is popular among researchers in the latest years.

4. Content Analysis

Overall, the empirical literature on ERM can be divided into four broad categories:

- ERM implementation
- Determinants of the ERM adoption
- The effectiveness of the ERM process
- Other aspects of ERM, such as ERM across domains, ERM strategies, ERM maturity, the impact of the institutional context on ERM adoption, ERM adoption in family firms, and ERM as moderating factor between different variables.

4.1. ERM Implementation

The implementation of ERM programs has gained importance in different domains: banks, insurance, and non-financial firms, especially SMEs. It can be inferred as a growing interest of researchers regarding ERM in SMEs (Thun et al. 2011). Strelcova et al. (2018) evaluate the ERM implementation process in 485 SMEs from Republik of Slovakia and found that only 75% of companies deal with risk management and only 24% of the firms have implemented risk management at all levels of activity. Arena et al. (2011) provide empirical evidence of ERM in practice on the example of several Italian companies from different industries. Fraser and Simkins (2016) describe the difficulties when implementing ERM and offer solutions to the firm in the process of conceptualization and execution. Among challenges, the authors mention the following: misconceptions, internal challenges, corporate culture, boards of directors' knowledge, identifying too many risks, no timeframes, not recognizing ERM as change management, and not making it meaningful. Moreover, it can be inferred, the great importance of the relationship between ERM and firm performance, which has been extensively analyzed (Gordon et al. 2009; Hoyt and Liebenberg 2011; Baxter et al. 2013; Farrell and Gallagher 2015; Grace et al. 2015; Ahmed and Manab 2016; Soltanizadeh et al. 2016; Spric et al. 2016; Zou and Hassan 2017; Callahan and Soileau 2017; Florio and Leoni 2017; Karanja 2017; Lechner and Gatzert 2018; Anton 2018; Yang et al. 2018; Suttipun et al. 2018; Annamalah et al. 2018; Heong and Teng 2018; Silva et al. 2019; Zou et al. 2019). Some studies handle risk modeling within the ERM framework in firms (Kotseruba 2010; Wu and Olson 2010c; Chen et al. 2010; Huang et al. 2011; Enyinda 2018; Braumann 2018).

In contrast to the richness of studies devoted to ERM engagement in SMEs, studies exploring the impact of ERM in banks or insurance are relatively few (Nguyen and Vo 2019; Durán Santomil and Otero González 2020). Lundqvist and Vilhelmsson (2018) report a negative association between ERM and credit default swap (CDS) spread of a bank, on a sample of 78 of the world's largest banks suggesting that ERM implementation decreases the CDS spread. Other studies handle risk modeling within the ERM framework in banking (Wu and Olson 2010b). Baxter et al. (2013) analyze the factors that influence ERM program quality and the relationship between ERM quality with firm performance and value in banking and insurance industries and report that ERM enhances accounting performance. Lower risk and higher revenues for the insurance industry after the ERM adoption are also reported by Eckles et al. (2014). Berry-Stolzle and Xu (2018) show that ERM implementation leads to a decrease in the cost of capital for firms from the US insurance industry. Altuntas et al. (2011) offer information about risk management practices in the German insurance industry. Also, in a subsequent study, Altuntas et al. (2019) demonstrate that ERM supports economies of scale and scope regarding revenue complementarities, based on a survey for German insurance companies. Yow and Sherris (2008) analyze the adoption of the ERM components by Australian insurers and found that frictional costs and financial distress costs motivate ERM engagement. Bohnert et al. (2019) find a significant positive relationship between ERM and firm value for European insurers. Jabbour and Abdel-Kader (2016) investigate the impact of institutional context on ERM adoption for the insurance sector and found divergent results in time: companies that decided towards ERM early were motivated by internal drivers, while the recent adoption decision was motivated by regulatory imperative.

The literature review shows that there are four methods used to measure ERM implementation:

- Employing the hiring announcement of a CRO or an equivalent position as a suggestion for ERM engagement (Pagach and Warr 2011);
- Looking by keywords for evidence of ERM in databases like Lexis, Nexis, and Dow Jones (e.g., Hoyt and Liebenberg 2011; Berry-Stolzle and Xu 2018; Anton 2018). The strings used in search are as follows: “enterprise risk management”, “chief risk officer”, “risk committee”, “strategic risk management”, “consolidated risk management”, “holistic risk management”, and “integrated risk management”;
- Using ERM ratings offered by Standard & Poor's for banks and insurance companies (e.g., Baxter et al. 2013; Eckles et al. 2014; Bohnert et al. 2019);
- Surveying firms to find the degree of ERM implementation (Zhao et al. 2014b; Zhao and Singhaputtangkul 2016; Soltanizadeh et al. 2016; Brustbauer 2016; Strelcova et al. 2018; Moshesh et al. 2018; Neto et al. 2018; Yang et al. 2018).

4.2. Determinants of ERM Adoption

Several empirical studies analyze the determinants (firm characteristics) on the adoption of ERM systems. Table 5 summarizes the determinants of investment in an ERM program based on previous literature.

Table 5. The determinants of ERM implementation.

Variables	Formula	Expected Relationship	Explanation/Authors
Firm size	Log (book value of assets)	Positive	Larger firms have an overall picture regarding risk identification and can run an ERM implementation program across multiple business units. There are multiple findings towards the likelihood of big companies engaging in ERM programs (Gordon et al. 2009; Farrell and Gallagher 2015; Lechner and Gatzert 2018; Berry-Stolzle and Xu 2018; Brustbauer 2016).
Financial leverage	Book value of liabilities/Market value of equity	Positive/negative	The results are mixed: both positive (Berry-Stolzle and Xu 2018) and negative relationships (Lechner and Gatzert 2018). The ERM implementations require financial resources and it is easier for firms with lower levels of leverage to initiate such a program. On the other hand, the ERM program leads to improved risk evaluation and reduced debt cost, therefore, on the background of these favorable conditions, firms may decide to increase their financial leverage.
Book-to-market ratio	Book value of equity/Market value of equity	Positive	ERM implementation is more of an interest for firms with high book-to-market ratios since ERM programs support them to preserve the franchise value (Berry-Stolzle and Xu 2018).
Merger and acquisition (M&A) activities	Intangible assets/Book value of total assets	Negative	The negative connection between recent M&A activities and a firm’s probability of initiate ERM adoption, since there may be no additional funds available to invest in such a program (Berry-Stolzle and Xu 2018).
Return on Assets	Net income/Book value of assets	Positive	ROA is appreciated to be an indicator of management efficiency, therefore, the firms with higher ROA are more likely to allocate financial resources towards an ERM engagement (Lechner and Gatzert 2018).
Capital opacity	Intangible assets/Book value of assets	Positive	Firms with high capital opacity are more likely to engage in ERM arrangements, under financial distress conditions (Lechner and Gatzert 2018).
Earnings volatility	Coefficient of variation of the quarterly earnings before interest and taxes (EBIT)	Positive	There could be multiple benefits for firms with volatile earnings to start implementing an ERM framework (Berry-Stolzle and Xu 2018).
Financial slack	(Cash + marketable securities)/Total assets	Positive	Increased levels of financial slack may determine the firms to pay for the initial investment required to run an ERM program (Berry-Stolzle and Xu 2018; Pagach and Warr 2011).
Managerial career	(Market value _t -Market value _{t-1})/Market value _{t-1}	Positive	ERM implementation enhances the informativeness of earnings and is a signal of management capabilities (Berry-Stolzle and Xu 2018).

Table 5. Cont.

Variables	Formula	Expected Relationship	Explanation/Authors
Business diversification	At least two business lines or two geographical location	Positive/Negative	It can be captured from both industrial and international perspectives and there is a positive relationship between business diversification and ERM implementation (Gordon et al. 2009; Lechner and Gatzert 2018), due to enhanced performance and risk reduction. On the other hand, increased industrial diversification can generate losses of information within conglomerates, while international diversification may cause agency problems (Hoyt and Liebenberg 2011).
Industry	Banking, insurance, energy	Positive	It seems like firms from certain industries are more likely to engage in an ERM process, due to regulatory requirements (Brustbauer 2016). Banking and insurance industries are subject to regulatory frameworks like Basel agreements and Solvency II. Also, energy is another domain with strong risk requirements (Lechner and Gatzert 2018).
Big Four auditor	KPMG, EY, Deloitte or PricewaterhouseCoopers	Positive	Firms are more likely to implement ERM if the annual auditor belongs to KPMG, EY, Deloitte, or PricewaterhouseCoopers (Lechner and Gatzert 2018)
Big Three rating	Standard & Poor's, Moody's or Fitch	Positive	Firms are more likely to implement ERM if they are rated by Standard & Poor's, Moody's, or Fitch Ratings (Lechner and Gatzert 2018).
Environmental uncertainty	Change or variability in the firm's external Environment	Positive	The higher the volatility of earnings, the more valuable an ERM engagement becomes (Gordon et al. 2009).
Industry competition	1-HHI (Herfindahl–Hirschman Index)	Positive	The higher the level of competition in an industry, the more important an ERM adoption should be (Gordon et al. 2009).
Monitoring by the board of directors	Number of directors/Log (sales)	Positive	ERM implementation is encouraged and dependent on an active board of directors (Gordon et al. 2009).
Ownership structure	Non-family firm managers	Positive	Non-family firms are more likely motivated to implement ERM programs (Brustbauer 2016).

Source: own work based on literature review.

Paape and Spekle (2012) found several factors that influence ERM implementation, as follows: regulatory environment, internal factors, ownership structure, and firm and industry-related characteristics. Zhao and Singhaputtangkul (2016) found three constructs of successful ERM engagement: commitment and implication of management, communication and understanding (CU), and execution and integration. Some studies reveal factors that play a moderating role between ERM and firms characteristics. For instance, competitive advantage is found to mediate the relationship between ERM systems and firm performance, while financial literacy moderates the nexus between ERM and competitive advantage (Yang et al. 2018). Also, according to empirical evidence of Saeidi et al. (2019), ERM exhibits a positive nexus with the firms' competitive advantage. Gordon et al. (2009) highlight five variables that play an important role in the ERM-firm performance equation: environmental uncertainty, industry competition, firm size, firm complexity, and monitoring by the board of directors. Kimbrough and Compton (2009) analyze the influence of organizational culture on ERM implementation, willing to highlight which culture is more suitable to roll out an ERM system. The authors found that ERM progress is linked positively to organic culture. Lundqvist (2015) highlights that corporate governance reasons are also determinants towards ERM implementation. Overall, the ERM system is a complex process, and Kanel et al. (2010) explain that there are three pillars of successful ERM engagement: a risk management cycle, a risk connection taxonomy, and an ERM maturity model.

It is worth mentioning that details concerning indicators and metrics used in the ERM process can be found in Scarlat et al. (2012), while a holistic approach to the ERM determinants is provided by Oliveira et al. (2019).

4.3. The Effectiveness of the ERM Process

The third line of research reveals studies that have considered the effects of ERM on various factors (firm performance, market value, cost of capital). The literature is rich in empirical studies that analyze whether ERM is related to firm performance. Despite mixed results, the predominant view is that ERM engagement enhances firm performance (Hoyt and Liebenberg 2011; Farrell and Gallagher 2015; Ahmed and Manab 2016; Soltanizadeh et al. 2016; Callahan and Soileau 2017; Florio and Leoni 2017; Karanja 2017; Lechner and Gatzert 2018; Anton 2018; Silva et al. 2019; Zou et al. 2019). Most of the studies provide US-based empirical evidence (Gordon et al. 2009; Hoyt and Liebenberg 2011; Baxter et al. 2013; Farrell and Gallagher 2015; Grace et al. 2015; Sprcic et al. 2016). Empirical research on the example of European countries is very limited, with ERM engagement enhancing firm value in Germany (Lechner and Gatzert 2018), Italy (Florio and Leoni 2017), Denmark (Sax and Andersen 2019), Romania (Anton 2018), Spain (Otero González et al. 2020). Based on a sample of 112 US firms, Gordon et al. (2009) argue that the relationship between ERM and firm performance is contingent. Also, for US non-financial companies, Sprcic et al. (2016) found that ERM has a positive effect on the market value in the short run, while, in the long run, ERM is not a determinant of market value. On the other hand, Marc et al. (2018) show that the US non-financial companies did not enjoy the positive effects of ERM adoption in the short run, the positive effects being visible over the longer-term. Hoyt and Liebenberg (2011) show that ERM engagement improves shareholders' wealth by at least 20%. Lechner and Gatzert (2018) illustrate that ERM adoption can add value for firms, based on the examples of listed companies from the German stock exchange. Sax and Andersen (2019) provide survey evidence of ERM association with higher profitability and lower financial leverage for the largest firms in Denmark. This is in line with Florio and Leoni (2017), who found a positive relationship between ERM adoption and both financial performance and market evaluation for Italian listed firms. Based on a sample of Romanian non-financial listed firms, Anton (2018) highlights that ERM implementation is associated with improved firm value. However, during the financial crisis period, the empirical findings show that ERM does not influence firm value in any significant manner. The lack of relationship between ERM quality and market performance during the global financial crisis of 2007–2008 is also reported by Baxter et al. (2013).

Also, in emerging economies, the performance of SMEs is positively influenced by ERM adoption (Ahmed and Manab 2016; Zou and Hassan 2017; Yang et al. 2018; Suttipun et al. 2018; Annamalah et al.

2018; Heong and Teng 2018; Silva et al. 2019; Hanggraeni et al. 2019; Nasr et al. 2019). Ahmed and Manab (2016) found that ERM adoption has significant positive effects on the non-financial performance of financial institutions in Nigeria. Yang et al. (2018) analyze the ERM and firm performance in Pakistan, considering the mediating role of competitive advantage and the moderating role of financial literacy. The authors show that firms that have implemented ERM practices show superior performance. This is consistent with Suttipun et al. (2018) for SMEs in Southern Thailand. Based on a sample of large financial firms, namely property and casualty insurers, Ai et al. (2018) show that ERM quality is a significant determinant of performance. A significant and positive relationship between ERM and firm performance is found by Annamalah et al. (2018) for the oil and gas sector in Malaysia. Also, on the example of 152 Malaysian SMEs, Heong and Teng (2018) show that ERM has a significant impact on sales performance. Silva et al. (2019) acknowledge also a positive association between firm value and ERM practices for Brazilian listed companies. However, Khalil-Oliwa (2019) explains that in firms with high-risk exposure, the value-added of the ERM process is limited and does not always generate a financial result for the Polish economy.

Going forward, Grace et al. (2015) analyze which aspects of ERM lead to increasing value and report the following: usage of economic capital models and dedicated risk managers subordinated to the board of directors or the chief executive officer.

The literature review highlights that most papers analyze ERM impact on the performance and market value of financial companies, however, only a few studies are analyzing the impact of ERM in non-financial firms (Marc et al. 2018; Anton 2018; Tjahjono 2017; Sprcic et al. 2016).

This strand of the literature regarding value creation of ERM adoption reveals several arguments to explain the process: ERM offers an effective way to improve different risk management activities (Lechner and Gatzert 2018); it increases capital efficiency (Lechner and Gatzert 2018); it decreases the underinvestment challenge in financially constrained companies; it cheapens the cost of external financing; it reduces the uncertainty of stock market returns (Eckles et al. 2014). Therefore, ERM engagement improves not only the firm's performance but also mitigates risk exposure (Florio and Leoni 2017). Also, ERM is found to influence, positively, corporate reputation, according to the empirical evidence provided by Perez-Cornejo et al. (2019) for Spain.

Regarding the impact of ERM on the cost of capital, this is found to decrease after ERM implementation, according to Berry-Stolzle and Xu (2018). The reasons are as follows: ERM enhances the information about the risk profile of firms; ERM adoption decreases the systematic risk; ERM is focused on reducing the probabilities of losses, therefore decreasing the need to raise external funds, with positive implications on the expected cost of capital. Guidance for firms seeking to understand capital allocation decisions under ERM operationalization, across business units and risk types can be found in Ai et al. (2012). Eckles et al. (2014) state that ERM engagement leads to the lower marginal cost of reducing risk. Also, risk disclosure is increasing after ERM adoption (Togok et al. 2016). ERM implementation is found to enhance risk performance as highlighted by Sax and Torp (2015) based on a survey among top Danish companies.

4.4. Other Aspects of ERM

The last strand of research focuses on other aspects of ERM in addition to the above-mentioned themes. There are also studies which analyze risk management strategies in other domains, like agriculture (Correa et al. 2018), supply chain (Moshesh et al. 2018; Wu and Olson 2010a), the bus market (Neto et al. 2018), the audit process (Bailey et al. 2018), production planning (Wu and Olson 2009), pharmaceutical industry (Rogachev 2008), and transportation (Curtis et al. 2012; Hallowell et al. 2013), the overall line of conclusion going towards formalizing ERM processes. Some studies investigate ERM maturity in different domains (Zhao et al. 2013; Zhao et al. 2014a; Oliva 2016; Farrell and Gallagher 2019) or ERM strategies (Subramaniam et al. 2015). Jabbour and Abdel-Kader (2016) investigate the impact of institutional pressure on ERM adoption for the insurance sector, while the work of Hiebl et al. (2019) is among the first analyzing ERM adoption in family firms from Austria and Germany.

ERM can also play a moderating role in today's business context. Wang et al. (2018) investigate the role of ERM as a potential moderating factor of the relationship between external financing activities and earnings management on the example of listed firms on the Taiwan Stock Exchange over the period 2004–2015 and found that managers use both real activities and accrual-based earnings while dealing with financing activities. An important moderating role of the relationship between firm flexibility and firm performance is also reported by Arnold et al. (2015). Moreover, enterprise risk management is found to partially mediate the nexus between business strategy and SME performance, according to Rehman and Anwar (2019).

5. Research Agenda

In this section, we propose several scientific steps that can be performed in order to enlarge the body of knowledge on ERM. Based on the systematic literature review, we identified potential future research directions, as follows:

- The organizational culture and enterprise risk management. Chen et al. (2019) acknowledge the important role that the organizational culture plays in the ERM process in the not-for-profit context, however, more research is welcomed. Enlarging the spectrum of possible determinants of the ERM process is also advisable by Saeidi et al. (2020) who observe the lack of empirical studies analyzing the effects of organizational culture on ERM effectiveness.
- The impact of cultural factors on ERM adoption. There is a pilot work of Liu (2019) who analyzed this aspect in a cross-cultural context of China and the US, acknowledging the importance of cultural factors. However, this stream of research is new, and more research is welcomed, for example, on the impact of culture on different components of ERM.
- The impact of institutional factors on ERM adoption. Jabbour and Abdel-Kader (2016) investigate the impact of institutional pressure on ERM adoption for the insurance sector and found divergent results in time: companies that decided towards ERM early were motivated by internal drivers, while the recent adoption decision was motivated by regulatory imperatives. Therefore, the researchers may explore how the enforcement of a regulatory framework influences ERM adoption and implementation.
- The efficiency of ERM in other domains like energy (that have higher exposure to risk) and/or financial institutions. For example, Jonek-Kowalska (2019) found that ERM engagement did not contribute to the stability of financial results and enterprise value in the energy sector. The same results are obtained by Khalil-Oliwa (2019) for enterprises with very high-risk exposure. On the other hand, most of the past studies on financial institutions have only concentrated on insurance companies (Yow and Sherris 2008; Hoyt and Liebenberg 2011; Altuntas et al. 2011; Eckles et al. 2014; Bohnert et al. 2019).
- The relationship between ERM and the financial reporting process. There is a seminal paper of Cohen et al. (2017) suggesting a strong relationship between ERM and financial reporting. Also, Shad et al. (2019) propose an integrated approach of ERM implementation with sustainability reporting to analyze the impact on business performance. However, more empirical evidence is needed to draw a general conclusion.
- The effectiveness of ERM by its components, meaning to identify which aspects of ERM add value. Useful insights can be inferred by evaluating all components of ERM, as indicated by the Committee of Sponsoring Organizations of the Treadway Commission. Past studies use mainly a dummy variable as a proxy for ERM implementation or surveys (i.e., Pagach and Warr 2011; Eckles et al. 2014; Ojeka et al. 2019).
- The value of ERM in supporting government management. Most of the time, the information remains in the middle or lower ranks of a public entity and the role of ERM is to open communication (Stanton 2015). There is a unique ERM system for every organization and the proper system can bring many benefits (Saeidi et al. 2020).

- The response of ERM to COVID-19 pandemic. A new line of research emerges in today's business context where the maturity of ERM should deal with new risks generated by the coronavirus crisis.
- ERM determinants and value-creating effects on the example of developing countries. Developing countries require a stronger risk management approach to well-functioning (Saeidi et al. 2020). There is a systematic dominance of studies on developed countries (Gordon et al. 2009; Hoyt and Liebenberg 2011; Arena et al. 2011; Altuntas et al. 2011; Baxter et al. 2013; Farrell and Gallagher 2015; Grace et al. 2015; Sprcic et al. 2016; Khan et al. 2016; Florio and Leoni 2017; Lechner and Gatzert 2018; Berry-Stolzle and Xu 2018; Altuntas et al. 2019; Sax and Andersen 2019) when compared to developing ones (Zhao and Singhaputtangkul 2016; Zou and Hassan 2017; Yang et al. 2018; Valaskova et al. 2018; Suttipun et al. 2018; Anton 2018; Annamalah et al. 2018; Heong and Teng 2018; Silva et al. 2019; Hanggraeni et al. 2019; Nasr et al. 2019; Khalil-Oliwa 2019). From the above-mentioned studies for developing countries, there is a concentration of studies in one category: the relationship of ERM with firm performance. Therefore, empirical evidence on how individual and organizational factors affect ERM engagement and the impact of the ERM process on other metrics, except firm performance, represents a promising avenue for future research. ERM implementation in firms from emerging countries is very important, as the benefits are the same as firms from developed countries (Suttipun et al. 2018).

6. Conclusions

ERM process has heterogeneously developed across the world, although the benefits of such engagement are well recognized. Academics have studied the process, but there is no complete picture of the determinants and implications of such an integrated risk management process. Therefore, we present a systematic empirical literature review on the ERM determinants and effects. Based on studies in management, economics, finance, engineering industrial, social sciences, and interdisciplinary studies, we reviewed the state-of-the-art empirical literature regarding the ERM process. Based on a research protocol, we selected 101 articles to be representative of our research question over the period 2008–2019.

The findings show that ERM literature can be divided into **four general lines of research**: ERM adoption, determinants of ERM implementation, the effects of ERM adoption, and other aspects. The first strand offers information about risk management practices (Altuntas et al. 2011; Almeida et al. 2019; Bensaada and Taghezout 2019; Beck da Silva Etges et al. 2019; Mishra et al. 2019). It can be inferred that there is a growing interest of researchers regarding ERM in SMEs. In contrast to the richness of studies devoted to the ERM engagement in SMEs, studies exploring ERM adoption in banks or insurance are relatively few. The second strand focuses mainly on firm characteristics and the decision to engage in the ERM process (Gordon et al. 2009; Pagach and Warr 2011; Hoyt and Liebenberg 2011; Farrell and Gallagher 2015; Brustbauer 2016; Lechner and Gatzert 2018; Berry-Stolzle and Xu 2018). The third strand of literature highlights the value-creating process of ERM adoption (see, for example, Altman et al. 2010; Hoyt and Liebenberg 2011; Eckles et al. 2014; Farrell and Gallagher 2015; Grace et al. 2015). The literature review has revealed that the most frequently investigated effect of ERM is on firm performance. Despite mixed results, the predominant view is that ERM engagement enhances firm performance.

It is found that the majority of the highly cited articles have analyzed the relationship between ERM adoption and firm performance. Also, the analysis of this literature reveals that the US is the main influential and productive country from an empirical perspective.

Given this, the paper lists potential research directions. We consider that little effort has been dedicated to the analysis of the effectiveness of ERM by its components and to institutional, individual, and organizational factors that affect ERM adoption. Also, the problem of ERM determinants and value-creating effects on the example of developing countries is insufficiently addressed. Looking at the impact of the COVID-19 pandemic on the international business context, the response of the ERM process to challenges faced by firms could represent a promising avenue for future research.

The paper follows a systematic literature review methodology, considered to be effective as it allows us to classify the studies under different themes followed by content analysis, in order to provide information about most analyzed and influential topics/counties/industries related to ERM and to develop future research directions. Therefore, the outcome of the review process improves the knowledge base for academicians and practitioners.

A limitation of this study could be the fact that it takes into account only the Web of Science indexed articles, and the findings could suffer modifications if one includes all the studies irrespective of the database index.

Our study presents several **academic and practical implications**. Firstly, it highlights the most researched and cited aspects related to ERM, based on the recent increasing trend of studies in the field. It can be inferred that the extant literature on ERM has given major attention to the examination of the relationship between the ERM and firm performance and most of the empirical findings are based on the experience of developed countries. The study can serve as a starting point for scholars to explore research gaps related to ERM, based on our findings and future research directions. The holistic approach of the paper enables researchers to identify under-investigated relationships, being support for advancing knowledge on ERM. Secondly, the practitioners can rely on the presented findings to identify the effects of ERM implementation. They can identify if an effect is constant across countries or industries or what are the sample characteristics that influence ERM implementation. Finally, it can be used as a reference point for papers on ERM, so that the body of knowledge can be enlarged.

Author Contributions: Conceptualization, S.G.A. and A.E.A.N.; methodology, S.G.A. and A.E.A.N.; software, A.E.A.N.; validation, S.G.A. and A.E.A.N.; formal analysis, S.G.A. and A.E.A.N.; investigation, S.G.A. and A.E.A.N.; data curation, S.G.A.; writing—original draft preparation, S.G.A. and A.E.A.N.; writing—review and editing, S.G.A. and A.E.A.N.; supervision, S.G.A.; project administration, S.G.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

References

- Abideen, Ahmed Zainul, Fazeeda Binti Mohamad, and Yudi Fernando. 2020. Lean simulations in production and operations management—A systematic literature review and bibliometric analysis. *Journal of Modelling in Management*. [CrossRef]
- Ahmed, Idris, and Norlida Abdul Manab. 2016. Moderating effects of board equity ownership on the relationship between enterprise risk management, regulatory compliance and firm performance: Evidence from Nigeria. *International Journal of Economics Management and Accounting* 24: 163–87.
- Ai, Jing, Patrick L. Brockett, William W. Cooper, and Linda L. Golden. 2012. Enterprise Risk Management through Strategic Allocation of Capital. *Journal of Risk and Insurance* 79: 29–55. [CrossRef]
- Ai, Jing, Vickie Bajtelsmit, and Tianyang Wang. 2018. The Combined Effect of Enterprise Risk Management and Diversification on Property and Casualty Insurer Performance. *Journal of Risk and Insurance* 85: 513–43. [CrossRef]
- Almeida, Rafael, Jose Miguel Teixeira, Miguel Mira da Silva, and Paulo Faroleiro. 2019. A conceptual model for enterprise risk management. *Journal of Enterprise Information Management* 32: 843–68. [CrossRef]
- Altman, Edward I., Gabriele Sabato, and Nicholas Wilson. 2010. The value of non-financial information in small and medium-sized enterprise risk management. *Journal of Credit Risk* 6: 95–127. [CrossRef]
- Altuntas, Muhammed, Thomas R. Berry-Stoelzle, and Robert E. Hoyt. 2011. Implementation of Enterprise Risk Management: Evidence from the German Property-Liability Insurance Industry. *Geneva Papers on Risk and Insurance-Issues and Practice* 36: 414–39. [CrossRef]
- Altuntas, Muhammed, Thomas R. Berry-Stoelzle, and David J. Cummins. 2019. Enterprise risk management and economies of scale and scope: Evidence from the German insurance industry. *Annals of Operations Research*. [CrossRef]

- Annamalah, Sanmugam, Murali Raman, Govindan Marthandan, and Aravindan Kalisri Logeswaran. 2018. Implementation of Enterprise Risk Management (ERM) Framework in Enhancing Business Performances in Oil and Gas Sector. *Economies* 6: 4. [\[CrossRef\]](#)
- Anton, Sorin Gabriel. 2018. The Impact of Enterprise Risk Management on Firm Value: Empirical Evidence from Romanian Non-Financial Firms. *Inzinerine Ekonomika-Engineering Economics* 29: 151–57. [\[CrossRef\]](#)
- Arena, Marika, Michela Arnaboldi, and Giovanni Azzone. 2010. The organizational dynamics of Enterprise Risk Management. *Accounting Organizations and Society* 35: 659–75. [\[CrossRef\]](#)
- Arena, Marika, Michela Arnaboldi, and Giovanni Azzone. 2011. Is enterprise risk management real? *Journal of Risk Research* 14: 779–97. [\[CrossRef\]](#)
- Arnold, Vicky, Tanya Benford, Joseph Canada, and Steve G. Sutton. 2015. Leveraging integrated information systems to enhance strategic flexibility and performance: The enabling role of enterprise risk management. *International Journal of Accounting Information Systems* 19: 1–16. [\[CrossRef\]](#)
- Bailey, Cristina, Denton Collins, and Lawrence Abbott. 2018. The Impact of Enterprise Risk Management on the Audit Process: Evidence from Audit Fees and Audit Delay. *Auditing—A Journal of Practice & Theory* 37: 25–46.
- Baxter, Ryan, Jean C. Bedard, Rani Hoitash, and Ari Yezegel. 2013. Enterprise Risk Management Program Quality: Determinants, Value Relevance, and the Financial Crisis. *Contemporary Accounting Research* 30: 1264–95. [\[CrossRef\]](#)
- Beck da Silva Etges, Ana Paula, Joana Siqueira de Souza, Francisco Jose Kliemann Neto, and Elaine Aparecida Felix. 2019. A proposed enterprise risk management model for health organizations. *Journal of Risk Research* 22: 513–31. [\[CrossRef\]](#)
- Bensaada, Ilies, and Noria Taghezout. 2019. An enterprise risk management system for SMEs: Innovative design paradigm and risk representation model. *Small Enterprise Research* 26: 179–206. [\[CrossRef\]](#)
- Berry-Stolzle, Thomas R., and Jianren Xu. 2018. Enterprise Risk Management and the Cost of Capital. *Journal of Risk and Insurance* 85: 159–201. [\[CrossRef\]](#)
- Blanco-Mesa, Fabio, Julieth Rivera-Rubiano, Xiomara Patino-Hernandez, and Maribel Martinez-Montana. 2019. The importance of enterprise risk management in large companies in Colombia. *Technological and Economic Development of Economy* 25: 600–33. [\[CrossRef\]](#)
- Bohnert, Alexander, Nadine Gatzert, Robert E. Hoyt, and Philipp Lechner. 2019. The drivers and value of enterprise risk management: Evidence from ERM ratings. *European Journal of Finance* 25: 234–55. [\[CrossRef\]](#)
- Braumann, Evelyn C. 2018. Analyzing the role of risk awareness in enterprise risk management. *Journal of Management Accounting Research* 30: 241–68. [\[CrossRef\]](#)
- Bromiley, Philip, Michael McShane, Anil Nair, and Elzotbek Rustambekov. 2015. Enterprise Risk Management: Review, Critique, and Research Directions. *Long Range Planning* 48: 265–76. [\[CrossRef\]](#)
- Brustbauer, Johannes. 2016. Enterprise risk management in SMEs: Towards a structural model. *International Small Business Journal-Researching Entrepreneurship* 34: 70–85. [\[CrossRef\]](#)
- Callahan, Carolyn, and Jared Soileau. 2017. Does Enterprise risk management enhance operating performance? *Advances in Accounting* 37: 122–39. [\[CrossRef\]](#)
- Chen, Hanning, Yunlong Zhu, Kunyuan Hu, and Xuhui Li. 2010. Virtual Enterprise Risk Management using artificial intelligence. *Mathematical Problems in Engineering* 1: 1–20. [\[CrossRef\]](#)
- Chen, Jinhua, Lu Jiao, and Graeme Harrison. 2019. Organisational culture and enterprise risk management: The Australian not-for-profit context. *Australian Journal of Public Administration* 78: 432–48. [\[CrossRef\]](#)
- Cohen, Jeffrey, Ganesh Krishnamoorthy, and Arnold Wright. 2017. Enterprise risk management and the financial reporting process: The experiences of audit committee members, CFOs, and external auditors. *Contemporary Accounting Research* 34: 1178–209. [\[CrossRef\]](#)
- Correa, R. G. Faria, Neto Kliemann, Joana Siqueira Souza, V. N. Lampert, and Julio Barcellos. 2018. Enterprise risk management in integrated crop-livestock systems: A method proposition. *The Journal of Agricultural Science* 156: 1–11.
- Curtis, Joyce A., Daniel D'Angelo, Matthew R. Hallowell, Timothy A. Henkel, and Keith R. Molenaar. 2012. Enterprise Risk Management for Transportation Agencies. *Transportation Research Record* 2271: 57–65. [\[CrossRef\]](#)
- Durán Santomil, Pablo, and Luis Otero González. 2020. Enterprise risk management and Solvency II: The system of governance and the Own Risk and Solvency Assessment. *Journal of Risk Finance* 21: 317–32. [\[CrossRef\]](#)

- Eckles, David L., Robert E. Hoyt, and Steve M. Miller. 2014. The impact of enterprise risk management on the marginal cost of reducing risk: Evidence from the insurance industry. *Journal of Banking & Finance* 49: 409–23.
- Enyinda, Chris I. 2018. Modeling enterprise risk management in operations and supply chain: A pharmaceutical firm context. *Operations and Supply Chain Management—An International Journal* 11: 1–12. [[CrossRef](#)]
- Farrell, Mark, and Ronan Gallagher. 2015. The Valuation Implications of Enterprise Risk Management Maturity. *Journal of Risk and Insurance* 82: 625–57. [[CrossRef](#)]
- Farrell, Mark, and Ronan Gallagher. 2019. Moderating influences on the ERM maturity-performance relationship. *Research in International Business and Finance* 47: 616–28. [[CrossRef](#)]
- Florio, Cristina, and Giulia Leoni. 2017. Enterprise risk management and firm performance: The Italian case. *British Accounting Review* 49: 56–74. [[CrossRef](#)]
- Fraser, John R. S., and Betty J. Simkins. 2016. The challenges of and solutions for implementing enterprise risk management. *Business Horizons* 59: 689–98. [[CrossRef](#)]
- Gordon, Lawrence A., Martin P. Loeb, and Chih-Yang Tseng. 2009. Enterprise risk management and firm performance: A contingency perspective. *Journal of Accounting and Public Policy* 28: 301–27. [[CrossRef](#)]
- Grace, Martin F., Tyler J. Leverty, Richard D. Phillips, and Prakash Shimpi. 2015. The Value of Investing in Enterprise Risk Management. *Journal of Risk and Insurance* 82: 289–316. [[CrossRef](#)]
- Grilli, Luca, Gresa Latifi, and Boris Mrkajic. 2019. Institutional determinants of venture capital activity. *Journal of Economic Surveys* 33: 1094–122. [[CrossRef](#)]
- Hallowell, Matthew R., Keith R. Molenaar, and Bernard R. Fortunato. 2013. Enterprise Risk Management Strategies for State Departments of Transportation. *Journal of Management in Engineering* 29: 114–21. [[CrossRef](#)]
- Hanggraeni, Dewi, Beata Slusarczyk, Liyu Adhi Kasari Sulung, and Athor Subroto. 2019. The impact of internal, external and enterprise risk management on the performance of micro, small and medium enterprises. *Sustainability* 11: 2172. [[CrossRef](#)]
- Heong, Yap Kiew Angeline, and Yap Saw Teng. 2018. COSO Enterprise Risk Management: Small-Medium Enterprises Evidence. *Asia-Pacific Management Accounting Journal* 13: 83–111.
- Hiebl, Martin R. W., Christine Duller, and Herbert Neubauer. 2019. Enterprise risk management in family firms: Evidence from Austria and Germany. *Journal of Risk Finance* 20: 39–58. [[CrossRef](#)]
- Hoyt, Robert E., and Andre P. Liebenberg. 2011. The value of enterprise risk management. *Journal of Risk and Insurance* 78: 795–822. [[CrossRef](#)]
- Huang, Min, Fu-Qiang Lu, Wai-Ki Ching, and Tak Kuen Siu. 2011. A distributed decision making model for risk management of virtual enterprise. *Expert Systems with Applications* 38: 13208–15. [[CrossRef](#)]
- Huang, Jim Yuh, Joseph C. P. Shieh, and Yu-Cheng Kao. 2016. Starting points for a new researcher in behavioral finance. *International Journal of Managerial Finance* 12: 92–103. [[CrossRef](#)]
- Jabbour, Mirna, and Magdy Abdel-Kader. 2016. ERM adoption in the insurance sector. Is it a regulatory imperative or business value driven? *Qualitative Research in Accounting and Management* 13: 472–510. [[CrossRef](#)]
- Jonek-Kowalska, Izabela. 2019. Efficiency of Enterprise Risk Management (ERM) systems. Comparative analysis in the fuel sector and energy sector on the basis of Central-European companies listed on the Warsaw Stock Exchange. *Resources Policy* 62: 405–15. [[CrossRef](#)]
- Kanel, Jürg, Eric W. Cope, Léa A. Deleris, Nitin Nayak, and Robert Torok. 2010. Three key enablers to successful enterprise risk management. *IBM Journal of Research and Development* 54: 1–15.
- Karanja, Erastus. 2017. Does the hiring of chief risk officers align with the COSO/ISO enterprise risk management frameworks? *International Journal of Accounting and Information Management* 25: 274–95. [[CrossRef](#)]
- Khalil-Oliwa, Oliwia. 2019. Effects of enterprise risk management (ERM) implementation. A comparative case study in the conditions of the Polish economy. *Ad Alta-Journal of Interdisciplinary Research* 9: 245–50.
- Khan, Majid Jamal, Dildar Hussain, and Waqar Mehmood. 2016. Why do firms adopt enterprise risk management (ERM)? Empirical evidence from France. *Management Decision* 54: 1886–907. [[CrossRef](#)]
- Kimbrough, Robert, and Paul Componation. 2009. The Relationship between Organizational Culture and Enterprise Risk Management. *EMJ-Engineering Management Journal* 21: 18–26. [[CrossRef](#)]
- Kotseruba, Natalia. 2010. Estimation of operational and financial risks within system of crisis overcoming management at a retail enterprise. *Actual Problems of Economics* 104: 120–28.
- Lechner, Philipp, and Nadine Gatzert. 2018. Determinants and value of enterprise risk management: Empirical evidence from Germany. *European Journal of Finance* 24: 867–87. [[CrossRef](#)]

- Liff, Roy, and Gunnar Wahlstrom. 2018. Usefulness of enterprise risk management in two banks. *Qualitative Research in Accounting and Management* 50: 124–50. [\[CrossRef\]](#)
- Liu, Xin. 2019. The Role of Enterprise Risk Management in Sustainable Decision-Making: A Cross-Cultural Comparison. *Sustainability* 11: 2939. [\[CrossRef\]](#)
- Lundqvist, Sara A. 2015. Why firms implement risk governance - Stepping beyond traditional risk management to enterprise risk management. *Journal of Accounting and Public Policy* 34: 441–66. [\[CrossRef\]](#)
- Lundqvist, Sara A., and Anders Vilhelmsson. 2018. Enterprise Risk Management and Default Risk: Evidence from the Banking Industry. *Journal of Risk and Insurance* 85: 127–57. [\[CrossRef\]](#)
- Marc, Mojca, Danijela Milos Sprcic, and Marina Mesin Zagar. 2018. Is Enterprise Risk Management a Value Added Activity? *E & M Ekonomije a Management* 21: 68–84.
- Mishra, Birendra K., Erik Rolland, Asish Satpathy, and Michael Moore. 2019. A framework for enterprise risk identification and management: The resource-based view. *Managerial Auditing Journal* 34: 162–88. [\[CrossRef\]](#)
- Moshesh, Reginald, Wesley Niemann, and Theuns Kotzé. 2018. Enterprise risk management implementation challenges: A case study in a petrochemical supply chain. *South African Journal of Industrial Engineering* 29: 230–44.
- Nasr, Arash Khalili, Saideh Alaei, Fateme Bakhshi, Farzin Rasoulyan, Hojat Tayaran, and Mohammad Farahi. 2019. How enterprise risk management (ERM) can affect on short-term and long-term firm performance: Evidence from the Iranian banking system. *Entrepreneurship and Sustainability Issues* 7: 1387–403. [\[CrossRef\]](#)
- Neto, Paschoal Frederico, Ricardo Fernandes Santos, and Fabio Lotti Oliva. 2018. Enterprise risk management in the bus market of the city of Sao Paulo. *Benchmarking—An International Journal* 25: 4103–24. [\[CrossRef\]](#)
- Nguyen, Duc Khuong, and Dinh-Tri Vo. 2019. Enterprise risk management and solvency: The case of the listed EU insurers. *Journal of Business Research* 113: 360–69. [\[CrossRef\]](#)
- Ojeka, Stephen A., Alex Adegboye, Kofo Adegboye, Oluwaseyi Alabi, Mosinmileoluwa Afolabi, and Francis Iyoha. 2019. Chief financial officer roles and enterprise risk management: An empirical based study. *Heliyon* 5: 1–10. [\[CrossRef\]](#)
- Oliva, Fabio Lotti. 2016. A maturity model for enterprise risk management. *International Journal of Production Economics* 173: 66–79. [\[CrossRef\]](#)
- Oliveira, Kyllbert, Mirian Mexas, Marcelo Meirino, and Geisa Drumond. 2019. Critical success factors associated with the implementation of enterprise risk management. *Journal of Risk Research* 22: 1004–19. [\[CrossRef\]](#)
- Otero González, Luis, Pablo Durán Santomil, and Aracely Tamayo Herrera. 2020. The effect of Enterprise Risk Management on the risk and the performance of Spanish listed companies. *European Research on Management and Business Economics* 26: 111–20. [\[CrossRef\]](#)
- Paape, Leen, and Roland F. Spekle. 2012. The Adoption and Design of Enterprise Risk Management Practices: An Empirical Study. *European Accounting Review* 21: 533–64. [\[CrossRef\]](#)
- Pagach, Donald, and Richard Warr. 2011. The Characteristics of Firms That Hire Chief Risk Officers. *Journal of Risk and Insurance* 78: 185–211. [\[CrossRef\]](#)
- Perez-Cornejo, Clara, Esther de Quevedo-Puente, and Juan Bautista Delgado-Garcia. 2019. How to manage corporate reputation? The effect of enterprise risk management systems and audit committees on corporate reputation. *European Management Journal* 37: 505–15. [\[CrossRef\]](#)
- Prasad, Punam, Sivasankaran Narayanasamy, Samit Paul, Subir Chattopadhyay, and Palanisamy Saravanan. 2018. Review of literature on working capital management and future research agenda. *Journal of Economic Surveys* 33: 827–61. [\[CrossRef\]](#)
- Rehman, Amin Ur, and Muhammad Anwar. 2019. Mediating role of enterprise risk management practices between business strategy and SME performance. *Small Enterprise Research* 26: 207–27. [\[CrossRef\]](#)
- Rogachev, Andrey Y. 2008. Enterprise Risk Management in a Pharmaceutical Company. *Risk Management—An International Journal* 10: 76–84. [\[CrossRef\]](#)
- Saeidi, Parvaneh, Sayyede Parisa Saeidi, Saudah Sofian, Sayede Parastoo Saeidi, Mehrbakhsh Nilashi, and Abbas Mardani. 2019. The impact of enterprise risk management on competitive advantage by moderating role of information technology. *Computer Standards & Interfaces* 63: 67–82.
- Saeidi, Parvaneh, Sayyede Parisa Saeidi, Leonardo Gutierrez, Dalia Streimikiene, Melfi Alrasheedi, Sayede Parastoo Saeidi, and Abbas Mardani. 2020. The influence of enterprise risk management on firm performance with the moderating effect of intellectual capital dimensions. *Economic Research-Ekonomska Istrazivanja*. [\[CrossRef\]](#)

- Sax, Johanna, and Torben Juul Andersen. 2019. Making risk management strategic: Integrating enterprise risk management with strategic planning. *European Management Review* 16: 719–40. [\[CrossRef\]](#)
- Sax, Johanna, and Simon S. Torp. 2015. Speak up! Enhancing risk performance with enterprise risk management, leadership style and employee voice. *Management Decision* 53: 1452–68. [\[CrossRef\]](#)
- Scarlat, Emil, Nora Chirita, and Ioana-Alexandra Bradea. 2012. Indicators and metrics used in the enterprise risk management (ERM). *Economic Computation and Economic Cybernetics Studies and Research* 46: 5–18.
- Shad, Muhammad Kashif, Fong-Woon Lai, Chuah Lai Fatt, Jiff Jaromir Klemes, and Awais Bokhari. 2019. Integrating sustainability reporting into enterprise risk management and its relationship with business performance: A conceptual framework. *Journal of Cleaner Production* 208: 415–25. [\[CrossRef\]](#)
- Silva, Juliano Rodrigues, Aldy Fernandes da Silva, and Betty Lilian Chan. 2019. Enterprise Risk Management and Firm Value: Evidence from Brazil. *Emerging Markets Finance and Trade* 55: 687–703. [\[CrossRef\]](#)
- Snyder, Hannah. 2019. Literature review as a research methodology: An overview and guidelines. *Journal of Business Research* 104: 333–39. [\[CrossRef\]](#)
- Soltanizadeh, Sara, Siti Zaleha Abdul Rasid, Nargess Mottaghi Golshan, and Wan Khairuzzaman Wan Ismail. 2016. Business strategy, enterprise risk management and organizational performance. *Management Research Review* 39: 1016–33. [\[CrossRef\]](#)
- Sprcic, Danijela Milos, Marina Mesin Zagar, Zeljko Sevic, and Mojca Marc. 2016. Does enterprise risk management influence market value - A long-term perspective? *Risk Management—An International Journal* 18: 65–88.
- Stanton, Thomas. 2015. The growing movement for enterprise risk management in government: The United States begins to catch. *Asia Pacific Journal of Public Administration* 37: 182–92. [\[CrossRef\]](#)
- Strelcova, Stanislava, Denisa Janasova, and Ladislav Simak. 2018. Risk management at Slovak enterprises: An empirical study. *Economic Annals-XXI* 174: 58–62. [\[CrossRef\]](#)
- Subramaniam, Nava, Dina Wahyuni, Barry J. Cooper, Philomena Leung, and Graeme Wines. 2015. Integration of carbon risks and opportunities in enterprise risk management systems: Evidence from Australian firms. *Journal of Cleaner Production* 96: 407–17. [\[CrossRef\]](#)
- Suttiapun, Muttanachai, Weerawan Siripong, On-Anong Sattayarak, Jittima Wichianrak, and Sutira Limroscharoen. 2018. The Influence of Enterprise Risk Management on Firm Performance Measured by the Balanced Scorecard: Evidence from SMEs in Southern Thailand. *ASR Chiang Mai University Journal of Social Sciences and Humanities* 5: 33–53. [\[CrossRef\]](#)
- Thun, Joern-Henrik, Martin Drueke, and Daniel Hoenig. 2011. Managing uncertainty—An empirical analysis of supply chain risk management in small and medium-sized enterprises. *International Journal of Production Research* 49: 5511–25. [\[CrossRef\]](#)
- Tjahjono, Subagio. 2017. Enterprise Risk Management implementation maturity in non-bank and financial companies. *Etikonomi* 16: 173–86. [\[CrossRef\]](#)
- Togok, Salinah Hj, Che Ruhana Isa, and Suria Zainuddin. 2016. Enterprise Risk Management Adoption in Malaysia: A Disclosure Approach. *Asian Journal of Business and Accounting* 9: 83–104.
- Tranfield, David, David Denyer, and Palminder Smart. 2003. Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *British Journal of Management* 14: 207–22. [\[CrossRef\]](#)
- Tworek, Piotr. 2016. Integrated risk management in metallurgical enterprises—Methodical approach. *Metallurgija* 55: 527–30.
- Valaskova, Katarina, Tomas Kliestik, and Maria Kovacova. 2018. Management of financial risks in Slovak enterprises using regression analysis. *Oeconomia Copernicana* 9: 105–21. [\[CrossRef\]](#)
- Wang, Teng-Shih, Yi-Mien Lin, Edward Werner, and Hsihui Chang. 2018. The relationship between external financing activities and earnings management: Evidence from enterprise risk management. *International Review of Economics & Finance* 58: 312–29.
- Wu, Desheng Dash, and David L. Olson. 2009. Enterprise risk management: Small business scorecard analysis. *Production Planning and Control* 20: 362–69. [\[CrossRef\]](#)
- Wu, Desheng Dash, and David L. Olson. 2010a. A review of enterprise risk management in supply chain. *Kybernetes* 39: 694–706.
- Wu, Desheng Dash, and David L. Olson. 2010b. Enterprise risk management: Coping with model risk in a large bank. *Journal of the Operational Research Society* 61: 179–90. [\[CrossRef\]](#)

- Wu, Desheng Dash, and David L. Olson. 2010c. Enterprise risk management: A DEA VaR approach in vendor selection. *International Journal of Production Research* 48: 4919–32. [[CrossRef](#)]
- Wu, Desheng, David Olson, and Alexandre Dolgui. 2015. Decision making in enterprise risk management: A review and introduction to special issue. *Omega-International Journal of Management Science* 57: 1–4. [[CrossRef](#)]
- Yang, Songling, Muhammad Ishtiaq, and Muhammad Anwar. 2018. Enterprise risk management practices and firm performance, the mediating role of competitive advantage and the moderating role of financial literacy. *Journal of Risk and Financial Management* 11: 1–17.
- Yow, Shaun, and Michael Sherris. 2008. Enterprise risk management, insurer value maximisation, and market frictions. *Astin Bulletin* 38: 293–339. [[CrossRef](#)]
- Zhao, Xianbo, and Natee Singhaputtangkul. 2016. Effects of firm characteristics on Enterprise Risk Management: Case study of chinese construction firms operating in Singapore. *Journal of Management in Engineering* 32: 1–9. [[CrossRef](#)]
- Zhao, Xianbo, Bon-Gang Hwang, and Sui Pheng Low. 2013. Developing Fuzzy Enterprise Risk Management Maturity Model for Construction Firms. *Journal of Construction Engineering and Management* 139: 1179–89. [[CrossRef](#)]
- Zhao, Xianbo, Bon-Gang Hwang, and Sui Pheng Low. 2014a. Investigating Enterprise Risk Management Maturity in Construction Firms. *Journal of Construction Engineering and Management* 140: 1–10. [[CrossRef](#)]
- Zhao, Xianbo, Bon-Gang Hwang, and Sui Pheng Low. 2014b. Enterprise risk management implementation in construction firms. An organizational change perspective. *Management Decision* 52: 814–33. [[CrossRef](#)]
- Zou, Xiang, and Che Hashim Hassan. 2017. Enterprise risk management in China: the impacts on organizational performance. *International Journal of Economic Policy in Emerging Economies* 10: 226–239. [[CrossRef](#)]
- Zou, Xiang, Che Ruhana Isa, and Mahfuzur Rahman. 2019. Valuation of enterprise risk management in the manufacturing industry. *Total Quality Management & Business Excellence* 30: 1389–410.

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).