

Article

Operational Risk Management in Banks: A Bibliometric Analysis and Opportunities for Future Research

Barkha Jadwani ^{1,*} , Shilpa Parkhi ² and Pradip Kumar Mitra ³

¹ Faculty of Management Symbiosis International (Deemed University), Pune 412115, India

² Symbiosis Institute of Business Management Pune, Symbiosis International (Deemed University), Pune 412115, India; dr.shilpa.parkhi@gmail.com

³ Vivekanand Education Society's Institute of Management Studies & Research, Mumbai 400074, India; pradip.mitra@ves.ac.in

* Correspondence: jadwanibarkha@gmail.com

Abstract: The last few years have witnessed tremendous challenges in the management of operational risks faced by banks and the emergence of newer risks. The working models for bank staff are now different; additionally, there has been a massive increase in the digitization level. All these aspects make operational risk management in banks an attractive field of study. There is a need to perform systematic bibliometric analysis in this research area, providing the various trends and highlighting areas for further research analysis. This research paper has examined the various aspects of operational risk management in Banks by performing a thorough bibliometric analysis of 676 articles extracted from two data databases, i.e., Scopus and Web of Science, from 2010 until March 2023. These were analyzed using the tools Biblioshiny and VOSviewer. Various bibliometric techniques like analysis of trends, citations, contributing authors, keywords, and bibliographic coupling have been performed. This research paper has significant theoretical and practical implications which can assist future researchers. Operational risks are ever-dynamic, and five themes, i.e., climate risk, information security risks, geopolitical risks, third-party risks and compliance risks, have been identified in this research paper as key focus areas for conducting research in the future. The findings of this study and suggestions for future research will be useful to academicians, policymakers, and operational risk management professionals for identifying potential areas of collaboration in the future to strengthen the operational risk management framework.

Keywords: operational risk; banks; operational risk management; bibliometric citation analysis; bibliometric studies; bibliometrix; biblioshiny; VOSviewer



Citation: Jadwani, Barkha, Shilpa Parkhi, and Pradip Kumar Mitra. 2024. Operational Risk Management in Banks: A Bibliometric Analysis and Opportunities for Future Research. *Journal of Risk and Financial Management* 17: 95. <https://doi.org/10.3390/jrfm17030095>

Academic Editors: Peterson K. Ozili and Thanasis Stengos

Received: 31 December 2023

Revised: 4 February 2024

Accepted: 7 February 2024

Published: 22 February 2024



Copyright: © 2024 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 (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

As per the Basel definition, operational risk is “the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events” (Basel Committee 2003). It clearly indicates that this is one of the risks with the most widespread causes, and it could be both internal and external. Additionally, high unpredictability in operational risk incidents has been observed; therefore, it is important to thoroughly analyze all the sources and ways to mitigate and manage operational risks. The last few years have seen dynamic changes and the emergence of new disruptive risk events. These have had a significant impact and have led to a tremendous increase in operational risk for both banks and corporations. In addition, there has been massive digitization that has various benefits; however, this also means that newer and more effective ways of managing operational risk would be required in the changing landscape.

The financial industry has seen several losses, such as frauds, fines and external events that can be mapped as operational risk (Chernobai et al. 2011). Most of these operational risk events have low probability, but some can have a huge impact. Management of these risks would require meticulous and robust risk management practices in banks. There

seems to be a shortage of practical skills and insufficient groundwork in the management of this risk (Masood and Fry 2012). These risks are interconnected with other risk types, which could lead to a more severe impact. A lot of granular details, data, regulatory mandates, etc., would be needed for effective management. These risks have been more challenging than other types of risks (Jadwani and Parkhi 2021).

One of the most recent operational risk events, i.e., the COVID-19 pandemic, had substantial implications around the globe; this disease was detected in all continents except Antarctica (McAleer 2020). This extraordinary crisis led to an economic slowdown, possible bankruptcies for some companies, distributed workforce models, and more digitization for companies. Sahoo and Ashwani (2020) mentioned that the conditions due to the pandemic demanded several fiscal-monetary incentives to enable small-scale companies to overcome and recover from this crisis. The various challenges for companies and their staff due to the new normal work scenario were discussed by Carnevale and Hatak (2020). There have been several lessons from this pandemic, and the risk management procedures need to be strengthened accordingly based on these learnings. This situation has had a major implication on the operations and supply chain (Sarkis 2020). Various suggestions could be used to rebuild future supply chains (Sharma et al. 2020a), and models can be developed to account for the views of managers in supply chains (Dellana et al. 2019). Technological developments can be used to develop a sustainable supply chain in this pandemic (Acioli et al. 2021). The response and approach to handling uncertainties have been included by Sharma et al. (2020b) in their paper, and recommendations for several policy amendments that require attention were proposed by Verma and Gustafsson (2020). Chang et al. (2020) have investigated the significant issues in various sectors, such as tourism, global health security, medical science, and risk management in business.

Several research papers have reviewed various factors, causes, and mitigants in this domain; however, there has been no study to analyze the various research conducted in this field overall. To bridge this gap, the objective of this research study is to analyze the various aspects of operational risk management (ORM) in Banks by performing a structured and detailed bibliometric analysis in this field and highlighting opportunities for future research. The research questions (RQ) for this study and their purpose have been mentioned in Table 1 below.

Table 1. Research questions for this study.

	Research Question	Purpose
RQ1	What are the most relevant and important keywords that can be used by future researchers to search for relevant articles in the existing literature in this domain?	To assist researchers in searching relevant articles based on keyword searches (Aria and Cuccurullo 2017).
RQ2	What are the current themes in the existing literature that can be used for further deep-dive analysis and the identification of research gaps by researchers in the future?	To analyze popular themes in the current research area. Gaps in research can be identified based on a review of existing literature.
RQ3	What are the emerging methods that can be used to perform a quick and effective structured literature review in the future?	This would help future researchers improve their productivity by performing faster and more effective structured literature reviews.
RQ4	What are the areas that should be focused on for conducting future research in this domain?	The most important research question that provides direction to future researchers and opportunities for advancement in this field of study (Khanra et al. 2021).

The first research question has been addressed by performing an analysis of keywords and their co-occurrences. A detailed review of significant studies in this domain has

provided insights to assist in the resolution of question number two. Question number three focuses on the emerging methods that can be used to conduct structured literature reviews in the future. In addition, for any bibliometric study to be effective and useful to future researchers in this domain, it is important to go beyond just a bibliometric analysis of past literature and identify areas that should be focused on for conducting future research in this domain. This has been addressed in question number four.

In addition to the introduction, this paper has five sections. A detailed literature review has been included in Section 2. Section 3 provides the methods adopted. Results have been presented in Section 4. Section 5 discusses the answers to the research questions, the future directions for further research in this domain, and theoretical and practical implications. The conclusions are presented in Section 6.

2. Literature Review

2.1. Overview of Operational Risk Management in Banks

A review of several research papers in the ORM domain in banks was conducted. [Oblakovic \(2013\)](#) conducted a research study of Swiss banks based on their current state of management of risk, which would be useful to these banks to benchmark their practices vis à vis their peers. Various challenges have been discussed by the author: lack of clarity in regulatory guidelines, insufficient management of risk, shortage of manpower who has the expertise to manage operational risk, inadequate data, shortcomings in communication and leadership insufficiencies. The author also provided suggested mitigants to overcome these challenges. This is an insightful study and would be very useful to researchers in this domain. It is pertinent to note that operational risks can only be managed and can never be eliminated; a strong risk management framework can help manage them. [D. Raju \(2013\)](#) concluded this based on the operational risk review in Indian banks. Such robust practices would include board and management oversight, clear strategies, a strong control culture, efficient monitoring, enhanced governance, strong ethics, segregation of duties and accountability. A larger board decreases the chances of risk occurrences related to operational issues ([Wang and Hsu 2013](#)). Based on their study of banks in Europe, [Barakat and Hussainey \(2013\)](#) recommended important aspects such as board independence, robust audit committees, and strong supervision by regulators in their paper. [Wu and Olson \(2010\)](#) showed the management of risk with the help of predictive scorecards for one big bank. As per [Choi \(2020\)](#), supply chains that are supported by a block have lesser operational risks in comparison with the traditional network of supply chains. There are several areas from the perspective of bank risk management where machine learning could be applied to solve peculiar problems ([Leo et al. 2019](#)).

2.2. Overview of Bibliometric Studies

Bibliometric studies systemically review bibliographic information by utilizing various quantitative methods ([Broadus 1987](#)). Researchers use several approaches to analyze past literature. Among these, bibliometric analysis is considered one of the best techniques. It can be used to examine and interpret vast quantities of literature pertaining to a certain domain in a structured manner and assist in identifying emerging areas ([Verma and Gustafsson 2020](#)). A review of recent studies on related topics was undertaken. Bibliometric analysis was recently performed on the management of risk and sustainability ([Nobanee et al. 2021](#)) using the Scopus database from 1990 to 2020, which was analyzed using VOSviewer software to identify important trends and themes in these areas. The authors identified concerns regarding sustainability globally and that everyone needs to take on social responsibilities to save the economy. Bibliometric analysis was also performed on the challenges and trends in sustainable corporate finance by the authors [Bui et al. \(2020\)](#) on the Scopus database to address the lack of systematic bibliometric analysis in this domain and identify future opportunities for further research. This analysis was performed using 227 articles, which clearly indicates that more research studies are required in this emerging risk domain. [Mohanty et al. \(2023\)](#), in their research on emerging research trends in green

finance, performed a thorough analysis of the Scopus database for 26 years from 1997 to 2023. This is one of the main drivers of economic sustainability in the future. Nobanee et al. (2023) performed a detailed bibliometric study to assess the research in this area of operational risk to highlight the risks and losses sustained by associations. The findings clearly indicate that there are significant benefits in the minimization of such risks. Goel et al. (2022) identified four themes based on a literature review performed on transmittable illnesses and tourism.

Siao et al. (2022) reviewed the trends in the last twenty years using the Web of Science database on environmental, social, and governance management (ESGM) using Bibliometrix, VOSviewer, and CiteSpace and analyzed how it was used to protect the environment and build value for organizations. Ruiz-Real et al. (2018), in their research, analyzed the dynamics of circular economy for an eleven-year period by performing bibliometric analysis highlighting various trends and indicating that this domain has a very high potential for future research. Ullah et al. (2023) presented a very thorough integrated study using research articles published in the seven largest databases. Additionally, the authors have also clearly mentioned the methodology to combine the databases using Excel and R software, which can be very useful to authors who want to perform integrated bibliometric studies in the future. Punjani et al. (2022), in their bibliometric analysis of cloud computing in agriculture, highlighted the various types of analysis in cloud computing, such as trend analysis, bibliographic coupling, network map analysis, etc. While this analysis focuses on cloud computing, this detailed study performed by the authors using Bibliometrix, Biblioshiny, and VOSviewer is actually very helpful to future researchers performing bibliometric studies.

2.3. Research Gaps and Significance of the Study

The various research papers in the ORM domain have highlighted the key factors, challenges, and mitigation techniques; however, there is a need to have a structured study to analyze the trends in the existing literature and uncover emerging areas for research. To bridge this gap, this research study aims to perform a thorough bibliometric analysis of the various aspects of operational risk management (ORM) in banks and highlight opportunities for conducting future research in this domain.

This study is significant since the detailed analysis, findings and suggestions for future research will be immensely useful to academicians, policymakers and operational risk management professionals who want to work together in these fields in the future to strengthen the operational risk management framework.

3. Materials and Methods

There are several tools that can be utilized for conducting bibliometric analysis. Bibliometric studies provided an organized representation of research (Rejeb et al. 2020). These studies are based on multiple scientific studies (Fetscherin and Heinrich 2015) and a statistical technique used to identify various trends in research. Bibliometric studies have also been used to perform thematic analysis. Themes are analyzed based on the quadrants where they are placed (Aria and Cuccurullo 2017). Bibliometrix and Biblioshiny software (<http://www.bibliometrix.org>) have been utilized in this study. In addition, VOSviewer version 1.6.19 has been used to visualize various network maps as part of this research study (Van Eck and Waltman 2010). Khanra et al. (2020) suggested an organized bibliometric protocol for such studies (refer to Figure 1 below).

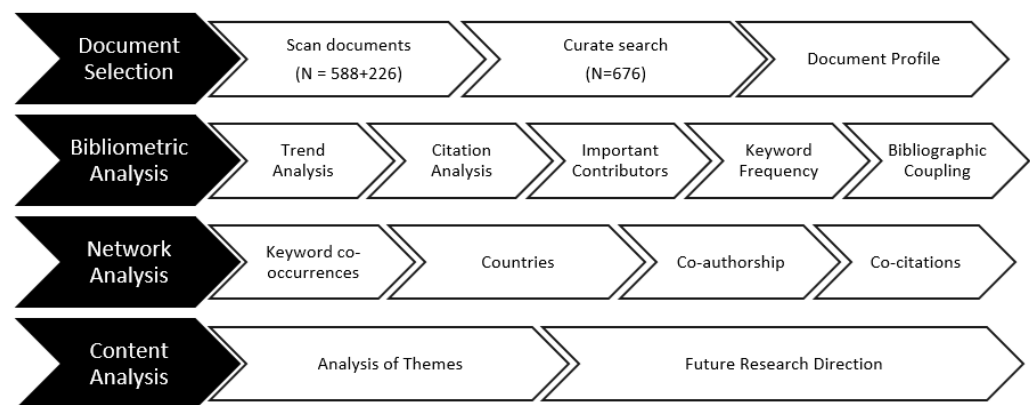


Figure 1. Organized bibliometric protocol used for this research study. Source adapted from Khanra et al. (2020).

Accordingly, the following steps to conduct this bibliometric analysis are discussed below.

3.1. Document Selection

The databases were selected first for the selection of documents, which were then used to search for research papers in this domain. It was decided to perform an integrated study using two databases, i.e., Web of Science and Scopus; then, keywords were selected. To perform the bibliometric analysis, research papers with the keywords “operational risk management in banks” were searched for the period of 2010 until March 2023. There were 588 articles retrieved from the Web of Science and 226 articles retrieved from Scopus. These were saved as a BIB file and then merged using the R and RStudio software (version (R 4.2.3)).

Rafael Queiroz (2022) discussed a simple methodology for merging these databases. Accordingly, the following steps were duly performed for the current bibliometric analysis.

- The downloading of R and RStudio;
- Exporting of the BIB file from Scopus;
- Exporting of the BIB file from Web of Science (WoS);
- The merging of BIB files to generate an XLSX file using RStudio (refer to Appendix A for the details of the code used);
- The uploading of the XLSX file to Biblioshiny (Bibliometrix’s interface) for performing analysis.

After removing 138 duplicates, a total of 676 items were used in this analysis.

3.2. Bibliometric Analysis

Various bibliometric techniques were performed on the final dataset of 676 items to provide a response to the research questions.

1. **Trend Analysis:** This analysis is useful to identify the patterns of literature growth and show if academicians have had more or reduced interest in a specific domain over this time span. The trend analysis was performed in this study for the period 2010 until March 2023.
2. **Citation Analysis:** With the help of citation analysis, important research papers and key authors who have made significant contributions to the research domain are pinpointed. Increased citations indicated a higher interest in that subject matter by academicians (Mahadevan and Joshi 2021). The citation analysis has been used in the current study to identify the top documents.
3. **Important contributors:** These would be the top authors, countries, journals, and affiliations. This is useful to identify key research done in this field and could possibly help in networking/collaborating for future research.

4. Keyword frequency analysis: This analysis helps identify the most frequently used words by authors to depict their research.
5. Bibliographic coupling: This technique is used to ascertain a similarity relationship between research papers. This technique is used as there are several common references (Khanra et al. 2021).

3.3. Network Visualization Analysis

With the help of the VOSviewer tool, several networks that existed in the literature dataset were envisioned (Van Eck and Waltman 2010). The following parameters have been analyzed:

1. Analysis of co-occurrences of the keywords: It is performed by mapping the relationships between author keywords, which provides insight into the approach followed by academicians.
2. Visual map of countries: This helps to understand the collaborations among several authors and countries. This enables the key clusters of countries that work together for the research to be reflected.

3.4. Content Analysis

The following are the key points of this analysis:

1. Analysis of themes: Various themes in the current domain of ORM in banks can be identified, and accordingly, further analysis could be performed.
2. Future research direction: Analysis of the content of the various research articles can help identify future research areas, which can be a tremendous help to researchers in this domain.

4. Results and Findings

4.1. Descriptive Statistics

The time span of this analysis is from 2010 to March 2023; 676 documents were used in this study; there were a total of 3283 authors; 2218 total keywords; 9843 total references, i.e., an average of 15 per article; and an average of 10 citations. In addition to the above items, some of the key bibliometric analysis output generated from the Biblioshiny software can be found in Table 2 below.

Table 2. Overall information of the data utilized for conducting bibliometric analysis using Biblioshiny software.

Details	Outcome
Sources (journals, books, etc.)	353
DOCUMENT CONTENTS	
Keywords plus (ID)	1443
Author’s keywords (DE)	2218
AUTHOR COLLABORATION	
Single-authored docs	117
Co-authors per doc	8.6
International co-authorships %	21.89

Figure 2 below shows the annual count of the articles. It clearly reflects that the research on ORM in banks has seen remarkable growth in this period.

Figure 3 below shows that the citations are highest in 2020, followed by 2021, 2018 and 2019. The increase in citations in recent years clearly indicates that operational risk management in banks as a research topic is gaining more significance.

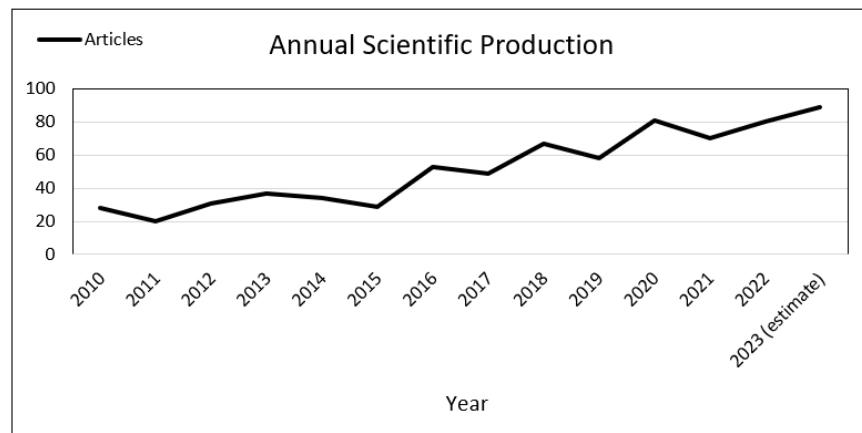


Figure 2. Annual Scientific Production using Biblioshiny software.

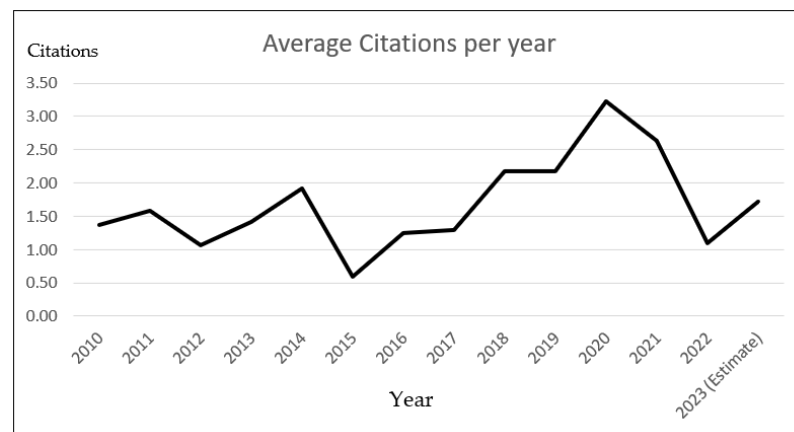


Figure 3. Annual Citations using Biblioshiny software.

Refer to Table 3 below for document citations. The topmost document has a total of 235 citations, which is almost 3.5 times of the 10th-highest-cited document with 67 citations.

Table 3. List of ten maximum global cited documents related to this domain using Biblioshiny software.

Title of Paper	Field of Research	References	DOI	Total Citations (TC)
“Efficiency Measures of the Chinese Commercial Banking System Using an Additive Two-Stage DEA”	Bank efficiency	Wang et al. (2014)	10.1016/j.omega.2013.09.005	235
“Bank Governance, Regulation, Supervision, and Risk Reporting: Evidence from Operational Risk Disclosures in European Banks”	Inadequate governance and disclosures	Barakat and Hussainey (2013)	10.1016/j.irfa.2013.07.002	123
“Enterprise Risk Management: Coping with Model Risk in a Large Bank”	Model risk	Wu and Olson (2010)	10.1057/jors.2008.144	114

Table 3. Cont.

Title of Paper	Field of Research	References	DOI	Total Citations (TC)
“Machine Learning in Banking Risk Management: A Literature Review”	Fraud risk	Leo et al. (2019)	10.3390/risks7010029	105
“Supply Chain Financing Using Blockchain: Impacts on Supply Chains Selling Fashionable Products”	Supply chain operational risk	Choi (2020)	10.1007/s10479-020-03615-7	101
“A Comprehensive Analysis of the Effects of Risk Measures on Bank Efficiency: Evidence from Emerging Asian Countries”	Relationship between risks and efficiency	Sun and Chang (2011)	10.1016/j.jbankfin.2010.11.017	97
“Operational risk and reputation in the financial industry”	Analysis of operational risk events	Gillet et al. (2010)	10.1016/j.jbankfin.2009.07.020	86
“Assessing the efficiency and total factor productivity growth of the banking industry: do environmental concerns matters?”	Environmental degradation	Shair et al. (2021)	10.1007/s11356-020-11938-y	74
“Risk in Islamic banking and corporate governance”	Corporate governance	Safiullah and Shamsuddin (2018)	10.1016/j.pacfin.2017.12.008	67
“The determinants of reputational risk in the banking sector”	Reputation risk	Fiordelisi et al. (2013)	10.1016/j.jbankfin.2012.04.021	62

4.2. Analysis of Important Authors and Countries

It is very important for researchers to know about the various top authors so that they can analyze and learn from their research. Figure 4 below provides the information about the top 10 authors. Nowadays, new researchers may connect with the authors on different social platforms.

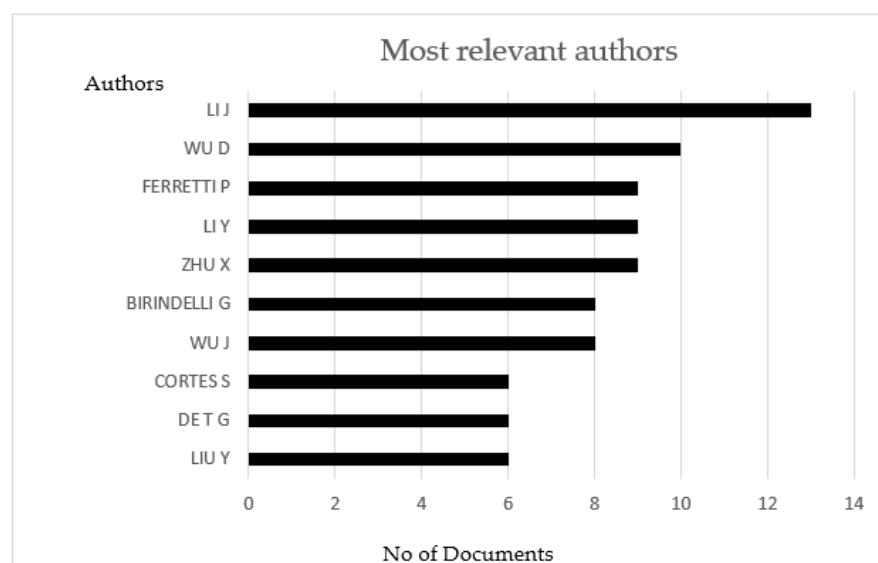


Figure 4. Most relevant and influential authors using Biblioshiny software.

Figure 5 provides the number of publications assigned per the author's country. Additionally, the citation count indicates the publication quality. Based on the details reflected in this figure, China has a maximum total citations of 1658, followed by the USA (803 citations) and the UK (775 citations).

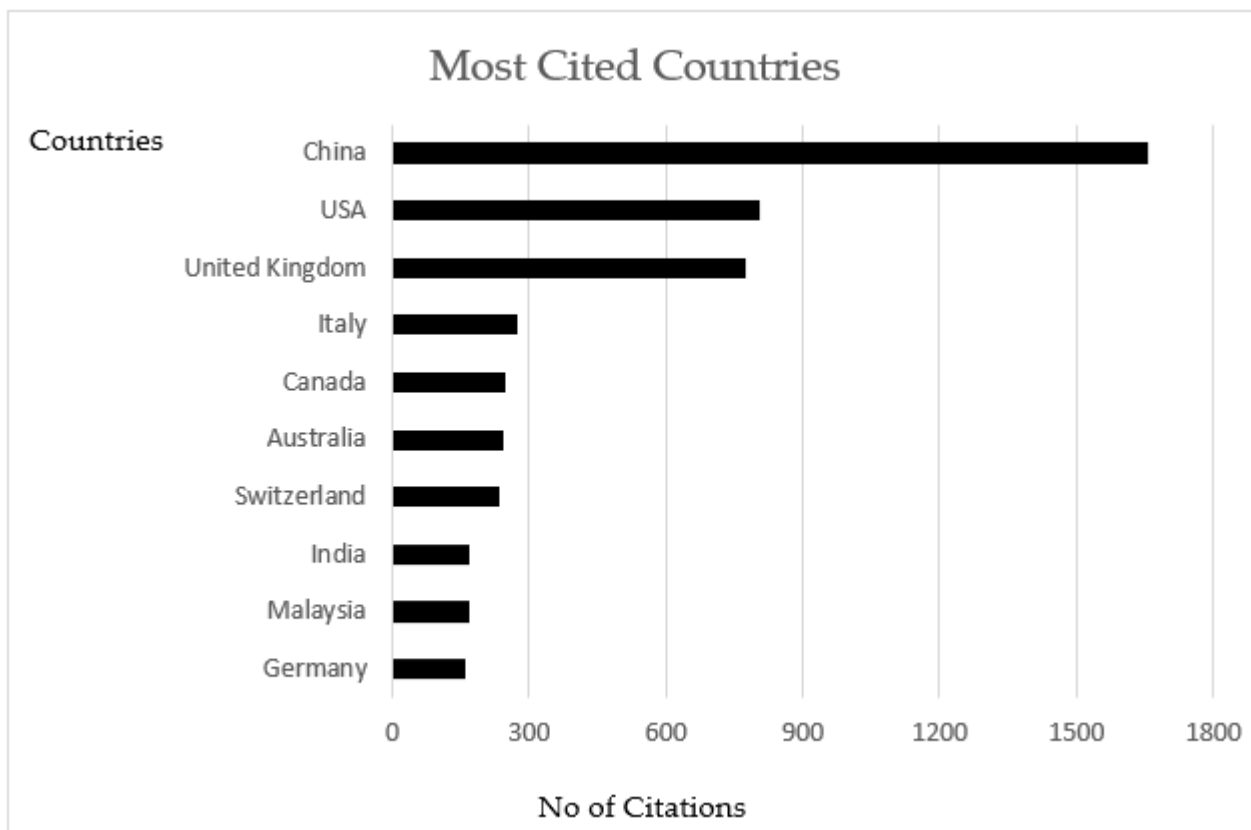


Figure 5. Most cited countries using Biblioshiny software.

4.3. Keyword Analysis

Keywords are the terms based on which the relevant research papers can be searched. It is important to use the correct keywords to locate the relevant research documents. In the various research paper publications, a list of author keywords is mentioned, which is a list of terms from the author's perspective that represents their research. An analysis of the most used keywords and their number of occurrences is presented in Figure 6. The topmost keyword is "risk", with 74 occurrences, followed by "performance" and "management", with 54 occurrences each. The other keywords, such as "model" and "impact", were used 43 and 40 times, respectively. A keyword search is a very effective tool and can help retrieve the various documents authors can refer to in their study.

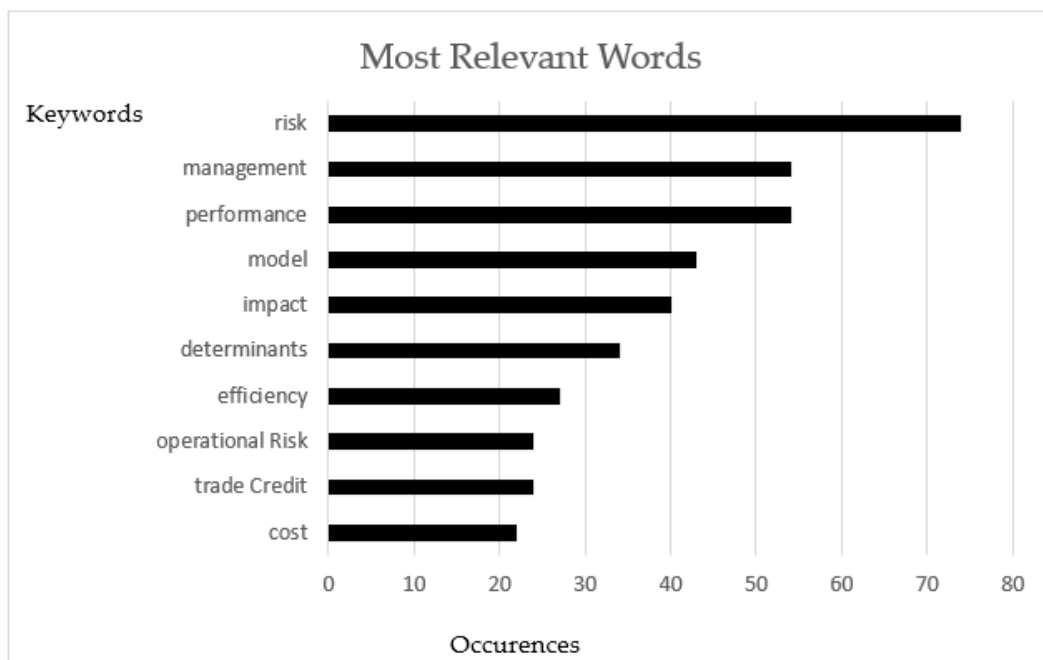


Figure 6. Most relevant keywords using Biblioshiny software.

4.4. Bibliographic Coupling

Bibliographic coupling is a method that is used to ascertain a similarity relationship between research papers. This occurs when two research papers have a literature or reference in common in their paper. This was performed using the VOSviewer tool. Table 4 depicts the results of bibliographic coupling and displays the top 10 journals, considering their overall link strength.

Table 4. Top 10 journals using bibliographic coupling, created using VOSviewer.

Journal	Total Link Strength
European Journal of Operational Research	6630
Journal of Operational Risk	3666
Journal of the Operational Research Society	2550
International Transactions in Operational Research	1860
Journal of Risk and Financial Management	1570
Journal of Banking & Finance	1272
Journal of Asian Finance Economics and Business	1120
Operational Risk Management in Banks: Regulatory, Organizational and Strategic Issues	1120
International Review of Financial Analysis	815
Financial and Credit Activity—Problems of Theory and Practice	810

4.5. Network Visualization Analysis

The tool VOSviewer was used to perform network visualization analysis. This exercise was performed on the entire list of 676 documents. This tool utilizes a gathering and system design method to envision several networks existing in any literature dataset. This tool is useful to evaluate the relationships among several parameters, for example, countries from co-authorship analysis. Such network visualization maps could be very helpful in identifying trends in research and collaboration prospects.

4.5.1. Visual Map of Co-Occurrences of Author Keywords

A network map was created to review the co-occurrences of author keywords (which have occurred more than five times), and duplicates due to variations in spelling were

removed. Figure 7 below displays the keyword co-occurrences map; it indicates that the words “risk management” and “operational risk” have the strongest link and the maximum number of co-occurrences. The map also indicates that these are strongly associated with risk, finance, risk assessment, banking, credit risk, liquidity, fraud, behavior, efficiency, and management. This supports the fact that various risk categories, such as operational risk, credit risk, and liquidity risk, are interrelated. Operational risk should never be viewed in isolation. It is strongly associated with other risk types. Thorough risk assessment and integrated risk management are the ways to manage such risks. Fraud, behavior issues, and financial instability could be some of the causes of operational risks.

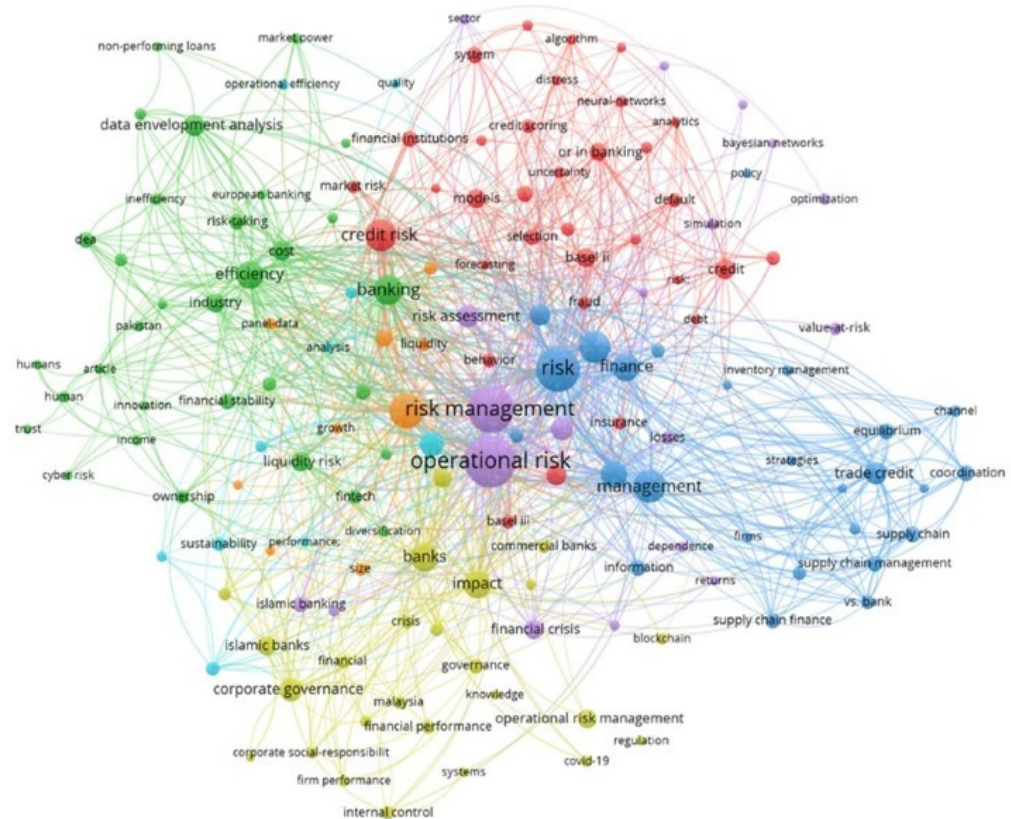


Figure 7. Visualization map of co-occurrences of keywords prepared with the help of VOSviewer.

4.5.2. Visual Map of Countries Based on Analysis of Co-Authorship

The network map of countries based on an analysis of co-authorship helps to assess the power of collaborations among various authors and countries. For operational risk management in banks, this analysis was performed using VOSviewer to review the strength of relationships; for the purpose of this analysis, the countries that have added a minimum of five research articles on this topic were included (refer to Figure 8 below). The map below reflects a total of eight key country clusters that have worked together. First one includes the Czech Republic, England, Germany, Italy, Scotland, Serbia, Sweden, Switzerland, and Turkey. China, Egypt, Iran, Pakistan, Saudi Arabia, Thailand, Tunisia, and Vietnam are the list of collaborating countries included in the second cluster. The third cluster comprises France, Brazil, the United Arab Emirates (UAE), the United Kingdom (UK), the United States (US), and Canada. The fourth and fifth clusters consist of Greece, India, Jordan, Malaysia, Nigeria, Romania and Jianping, China, South Korea, Taiwan, USA, and Xiaoqian, respectively. Ghana, Poland, Portugal, South Africa, and Spain belong to the sixth cluster. The seventh and eighth clusters have only three countries (Belgium, Japan, and Netherlands) and two countries (Australia and Indonesia), respectively. Although

the strength of collaboration is highest within clusters, the authors from separate clusters collaborate as well in the field of academic research.

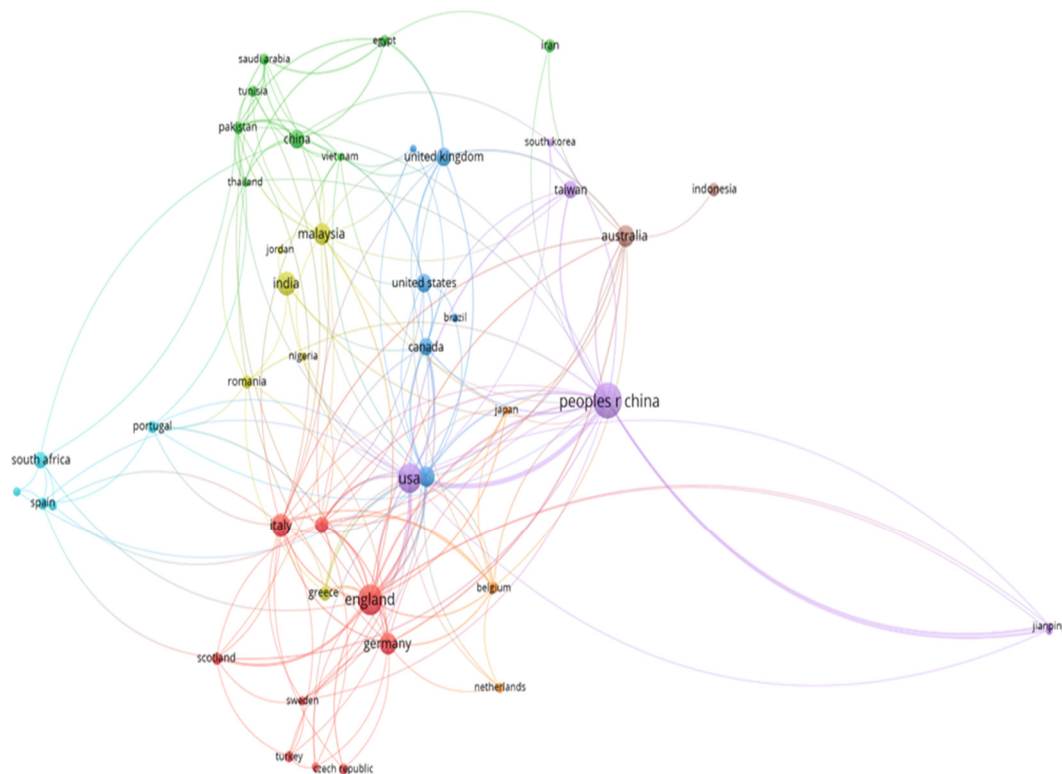


Figure 8. Country visual map based on analysis of co-authorship prepared utilizing VOSviewer.

4.6. Thematic Analysis

The various literature reviewed related to ORM in banks has been categorized into the following themes at a high level:

- Analysis of various operational risks and ways to mitigate such risks;
- Operational risk management regulations;
- Operational risk modeling.

To assist future researchers further, a detailed review of 25 key research papers in this domain has been performed. Their focus areas, data sources, and methods/tools used to perform the analysis are displayed in Table 5. The review of sources/methods used in the existing literature would assist future researchers, who can then perform a further deep dive analysis and identify new tools/methods that can be used to enhance this research domain further. Additionally, the risk analysis focus areas in the existing literature would help to identify any research gaps and areas where future research should be focused.

Table 5. Risks analyzed, sources and methods of key research papers.

Risk Analysis	Primary Data Source	Analysis Method/Tool	References
Inadequate governance and disclosures	Review of risk disclosures	Multivariate regression	Barakat and Hussainey (2013)
Fraud risk	Literature review: Machine learning	Evaluation of machine learning	Leo et al. (2019)
Relationship between risks and efficiency	Data from Bankscope database	Stochastic frontier approach and data envelopment analysis using Stata 9.0 software	Sun and Chang (2011)

Table 5. Cont.

Risk Analysis	Primary Data Source	Analysis Method/Tool	References
Analysis of operational risk events	Data from the FIRST database	Analysis of returns around the operational loss event date	Gillet et al. (2010)
Environmental degradation	Data on efficiency and total factor productivity	Data envelopment analysis	Shair et al. (2021)
Corporate governance	Data from Bankscope database	Multivariate regression	Safiullah and Shamsuddin (2018)
Reputation risk	Data on operational risk events	Multivariate regression	Fiordelisi et al. (2013)
Analysis of operational risk events	Data from the FIRST database	Multivariate regression	Wang and Hsu (2013)
Corporate governance	Analysis of various literature in this domain	Discussion/Review	Ginena (2014)
Integrated risk management	Market and credit loss returns	Time series, marginal loss return distributions and the copula parameters	Grundke (2010)
Systemic operational risk	Review of LIBOR manipulation	Discussion/Review of Systemic Operational Risks	McConnell (2013)
Relationship between risks and efficiency	Banking industry data	Stochastic frontier approach	Delis et al. (2017)
Determinants of risk disclosures	Annual reports of banks	Creation of Risk Disclosure Index	Nahar et al. (2016)
Reputation risk	Detailed academic analysis of these new insurance policies and conceptualization of reputation risk	Discussion/Review	Gatzert et al. (2016)
Systemic risk and financial contagion	Credit default swap data	Tlasso model	Torri et al. (2018)
Risk management committee determinants and consequences	10-K Wizard keyword search on financial institutions	Probit regression model	Hines and Peters (2015)
Risk management and financial stability	Ratios calculated based on data from the State Bank of Pakistan	OLS regression Model	Hafiz et al. (2019)
Human operational risk management	Data on four random variable sets, i.e., demand, capacities, initial capability and operation efficiency	Stochastic programming techniques	Fragniere et al. (2010)
Business complexity and risk management	Data on operational risk events	Analysis of key contributing factors	Chernobai et al. (2011)
Information asymmetry	Analysis of operational announcements and their trades on the stock exchange	Information asymmetry model	Barakat et al. (2014)
Issues in operational risk capital modeling	Published literature and author's experience	Discussion/Review	Chaudhury (2010)
Cybersecurity hazards	Literature review	Systematic Review	Uddin et al. (2020)
Barriers to the implementation of Basel regulations	Survey questionnaire	Logistic Regression Model	Masood and Fry (2012)
Relationship between credit risk and operational risk	Survey questionnaire	PLS-SEM model	Rehman et al. (2020)
Estimation of maximum potential losses	Digital banking transaction risk data due to downtime	Extreme Value at Risk	Saputra et al. (2022)

5. Discussion

In this study, a structured bibliometric analysis has been performed in this domain, which helps analyze the status and trends and come up with areas that need focus in the future.

5.1. Analysis of Trends and Significant Contributors to This Research Field

Various bibliometric techniques, such as analysis of various sources, authors, their associations, and countries, and bibliographic coupling have been applied using Biblioshiny software. With this, the status and trends in this research domain have been examined.

Trend Analysis: The annual trends in production and citation have been shown in Figures 2 and 3. As compared to 2010, the count of annual production in 2022 and 2023 estimates shows a significant increase in the production of articles in this domain (2022 actuals are almost three times the 2010 actuals). Similarly, there has been consistency in citations over this entire period and a surge in recent years, which shows that this research is gaining more importance.

Top Authors: The most important authors are Li J., Wu D., and Ferreti P., with 13, 10, and 9 documents, respectively. Based on bibliographic coupling (Figure 4), Birindelli and Ferretti are the most influential authors who have made a significant contribution to this research field. New researchers may refer to the work of important authors to get more insight into this domain and inspiration guidance to perform their research.

Top Countries: The number of citations is an important metric to reflect the quality of the publication; the maximum number of citations is in China, followed by the USA and the UK (Figure 5). China is also the country with the maximum number of article publications. Researchers use various parameters to identify research gaps, and one such parameter could be to identify the country with little or no research. The average production has seen a significant increase, which is a positive sign and indicates the importance of this research area, which is having an upward trend.

Top Documents: Barakat and Hussainey (2013) have recommended in their paper the sustaining of board independence, robust audit committees and strong supervision by regulators based on their study of banks in Europe. This paper has 123 citations (refer to Table 3). Wu and Olson (2010) discussed the management of risk with the help of predictive scorecards for one big bank; this is one of the key research papers cited in 114 documents. Higher citation scores indicate better quality and that the paper is of use to many researchers.

Top Journals: Considering the total link strength, the top journals are mentioned in Table 4. Researchers who want to enhance their knowledge in this domain should peruse the articles published in these journals and work on quality publications accordingly.

5.2. Analysis of the Most Relevant and Important Keywords in This Domain

The first research question has been addressed by performing an analysis of keywords and keyword co-occurrence analysis. These keywords are useful for researchers to search for relevant papers in the domain, which can be used to conduct research studies and identify gaps in the existing literature. The topmost keyword is “risk”, with 74 occurrences, followed by “performance” and “management”, with 54 occurrences each (Figure 6). Based on the keyword co-occurrences map (Figure 7), the words “risk management” and “operational risk” have the strongest link and the maximum number of co-occurrences.

5.3. Current Themes

To address the second research question, a review of the existing literature was performed to identify current themes, and additionally, a detailed review of 25 key research papers in this domain was performed. An analysis of the current literature would help researchers identify gaps in the research, on which they can focus to enhance the current literature. In addition, newer methods and tools can be used to enrich the research domain further.

5.4. Emerging Methods for Performing Structured Literature Review in the Future

To answer the third research question, an analysis of various new tools using artificial intelligence (AI) was performed, which can help researchers swiftly identify relevant thrust areas and future research papers in their domain. One such example is openknowledgemaps.org (Open Knowledge Maps <https://openknowledgemaps.org> accessed on 29 October 2023); Figure 9 below displays the results from this portal for a search on “operational risk management in banks”. The search results show the 100 most relevant documents for the selected topic. This portal not only helps identify the categories of 100 key research papers, but it also provides a link to the selected research paper in the respective circle, through which it can be accessed at the click of a button. In the case of open access, the full paper can be easily accessed and reviewed by the researcher. Thus, it can really help the researcher to perform effective as well as faster literature reviews related to their research domain.

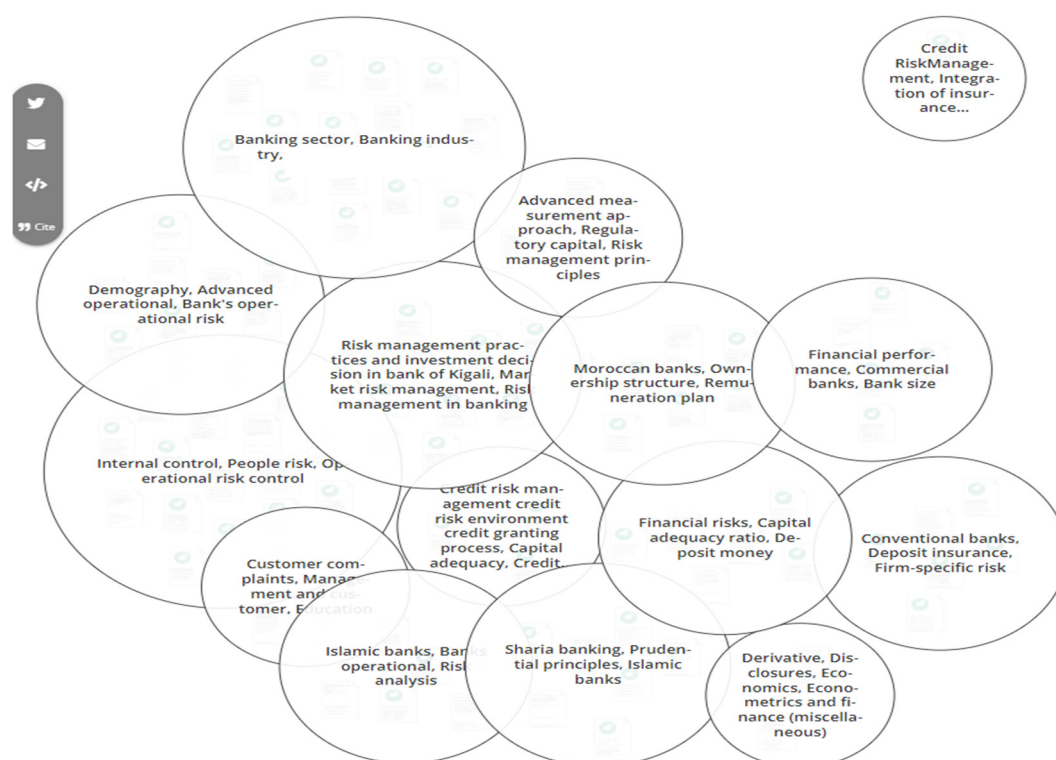


Figure 9. Open knowledge maps (2023). Knowledge map for research on operational risk management in banks. Generated by the authors at <https://openknowledgemaps.org> (accessed on 29 October 2023).

Another such tool is litmaps (Litmaps, <https://app.litmaps.com> accessed on 29 October 2023), which can be of great assistance while performing a literature review by the researcher. A seed paper can be selected, and then from that paper, Litmaps can be generated, which is a map of the top citations and references to this seed article, which can provide a good overview of the specific topic.

In addition to the above two tools, there are several other tools such as carrot² (Carrot², <https://search.carrot2.org/#/search/web> accessed on 29 October 2023) publish or perish (Publish or Perish—Harzing.com, <https://harzing.com/resources/publish-or-perish> accessed on 5 November 2023), citation gecko, (Citation Gecko, <https://www.citationgecko.com/> accessed on 5 November 2023) connected papers (Connected Papers, <https://www.connectedpapers.com/> accessed on 5 November 2023) and researchrabbit (Research Rabbit: <https://www.researchrabbit.ai/> accessed on 5 November 2023), which can be further explored by researchers in the future for performing literature studies in their domain.

Each AI tool has its own niche. Some of them provide similar papers, most important papers, recent papers by top authors, upcoming authors, top journals, etc. Based on the researcher's requirements, an appropriate tool may be suitably selected.

5.5. Future Research Scope in This Domain

The review of significant research articles in this domain has helped to answer research question number four. The following five key areas have been identified for conducting future research:

- **Climate risk impact analysis:** This topic has emerged as a significant focus area in the last few years due to the tremendous impact that could be a result of climate-related risks. The pandemic also furthered these concerns, as it was thought to be a consequence of human actions. There has been an increased awareness of climate-related risks among various institutions. Sustainable green financing is the way forward in the future. A detailed analysis of the impact of climate risks on banks would be a brilliant option for conducting research in the future.
- **Information security risk:** There has been an accelerated pace of digitization in the last few years, which has resulted in complex and more prevalent cyber security and data-related risks. Appropriate analytics tools would be required to manage these risks. A detailed study of the trends in this area would be of great use to bankers, corporations, and regulators for the management of these risks.
- **Geopolitical risk:** In the last few years, several sources of geopolitical risk have emerged, such as the Russia–Ukraine conflict, the Israel–Palestine war, strained relations among various countries, higher inflation, and competing interests across Europe. The geopolitical situation has become unpredictable, and enhanced risk expertise is required to cope with this rapidly changing risk environment. Banks are important participants in ensuring the flow of funds across the globe, and such risks impact the investment decisions made by global investors. The friction among countries impacts their trade decisions, and if this is extended for a longer time, it will have a significant impact on those countries. A thorough analysis of the impact of geopolitical risks on banks would be an insightful area for future research.
- **Third-party risk:** The COVID-19 pandemic and the surge in geopolitical events in the recent past have made it necessary for banks and organizations to review the relationships with third-party providers as there is a high probability of risks related to disruption. Therefore, various risk considerations, such as data-related risks, cyber security, concentration risk, and contingency planning, would need to be considered while making third-party decisions. An analysis of the ever-dynamic third-party risks can be an interesting area for future research.
- **Regulatory compliance risk:** Banking organizations need to adhere to regulations issued by several local and global regulators. In addition, there has been an increased volume of regulatory changes with stringent timelines; therefore, managing regulatory compliance is challenging for both banks and their customers. Additionally, it has been observed that regulators across the globe have zero tolerance for any non-compliance, which increases the risks of penalties manifold. A detailed analysis of this risk category and coming up with best practices to mitigate these risks would be a useful research area for bankers, regulators, and academics.

Additionally, the detailed analysis of existing literature, the risk categories analyzed, their sources, methods, and tools revealed several data analysis techniques used in these articles, such as regression analysis, analysis of variances, data envelopment analysis, etc., based on a review of secondary data in most cases. This clearly indicates that there is a need to perform analysis in this field based on a combination of primary and secondary data, which will enable us to add to the perspective of the current research studies. There is also an opportunity to use tools such as Total Interpretative Structural Modeling (TISM) and Structured Equation Modeling (SEM), which have been used in various domains and can be expanded to conduct further studies in the domain of ORM in banks.

5.6. Theoretical and Practical Implications

This research analysis made various contributions to this field and contributed overall to the learnings in this domain. This is an integrated review for the period 2010–2023 using two databases and analyzing the influential authors, journals, and countries in the research literature and their interrelationships. The present study has used bibliographic coupling to present the most influential authors, journals and countries that have made significant contributions. The network visualization of keyword co-occurrences shows the major trends and helps in identifying research gaps. The study has also clearly articulated the step-by-step procedure for conducting an integrated bibliometric study, which can help future researchers who can review this to perform similar research in their research domains. Based on the content analysis, the areas and techniques identified for conducting future research can be tremendously useful for researchers in this domain. The best part of such bibliometric studies is that various researchers can adapt them to perform analysis based on different keywords in different domains. Although the above analysis is performed on ORM in banks, researchers can easily adapt it to perform similar analyses in their research field.

6. Conclusions

The count of research papers in this domain has seen an upward trend; this clearly indicates that this research area is gaining significant importance and that there are newer dimensions in this domain. Based on the keyword co-occurrences analysis performed to answer the first research question, the words “risk management” and “operational risk” have the strongest link and the maximum number of co-occurrences. A detailed analysis of various sources and methods used in the existing literature, which was performed to address the second research question, can help future researchers identify areas where further deep-dive analyses should be conducted to enhance this research domain. Various new tools using artificial intelligence (AI) reviewed as part of research question three can assist future researchers in performing faster literature reviews and swiftly identifying relevant thrust areas and research papers in their domain. Anticipatory and systemic controls are the way forward in place of manual intensive and post facto controls. Manual controls would not be able to keep pace with the speed of digitization and the changing dynamics. There are several aspects of this study that will be very useful to new researchers performing research in this area. Firstly, this analysis is based on an integrated study of two databases, i.e., Web of Science and Scopus, instead of using a single database. It is important to comprehensively and systemically review the past literature to identify trends, challenges, and the future scope of research. Secondly, the researchers should be aware of the top authors and most influential journals so that they can structure their own research accordingly to enhance the body of knowledge in this domain. Thirdly, the methodology used in this analysis can easily be replicated by researchers in their domain as this does not require any coding skills. The Biblioshiny tool and Bibliometrix package are very user-friendly and can be used to perform an integrated study and remove duplicates. The VOSviewer is also an easy-to-use tool that has assisted in generating the visual network maps used in this analysis. Operational risk is a dynamic research domain, and studying the trends is important to identify research gaps. The detailed review to address research question four has helped identify five key future research areas: climate risks, information security risks, geopolitical risks, third-party risks and compliance risks. There is an increasing threat of climate-related changes, and therefore, it is important to perform further research in this area to identify ways to mitigate these risks.

Due to the extensive adoption of digital technologies, analysis of information security risks is another emerging field. The surge in geopolitical events in the last few years and the increasing complexities and their impact on third-party risks have led to the emergence of these two insightful areas that future researchers can focus on. Lastly, due to the stringent and complex regulations, a thorough analysis of compliance risks and the development of best practices and governance to ensure quality compliance with various

regulatory guidelines can be a valuable area of future research. Overall, this research study has performed a thorough bibliometric analysis in this domain and emphasized five key emerging risks, which will be useful to academicians, policymakers, and operational risk management professionals who want to work together on these focus areas in the future to strengthen the operational risk management framework.

Author Contributions: Conceptualization: B.J., S.P. and P.K.M., Methodology: B.J., S.P. and P.K.M., Software: B.J., S.P. and P.K.M., Validation: B.J., S.P. and P.K.M., Formal Analysis: B.J., S.P. and P.K.M., Investigation: B.J., S.P. and P.K.M., Resources: B.J., S.P. and P.K.M., Data Curation: B.J., S.P. and P.K.M., Writing—Original Draft: B.J., Writing—Review and Editing: B.J., S.P. and P.K.M., Visualization: B.J., S.P. and P.K.M., Supervision: S.P. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Data are available from the authors upon request.

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

Appendix A

Below code was used for merging bib files to generate an xlsx file using RStudio without duplicates:

```
"# install.packages("bibliometrix") # if you don't have it installed setwd("/home/rafael/merge-scopus-wos/bib") library(bibliometrix) S = convert2df("scopus.bib", dbsource = "scopus", format = "bibtex") W = convert2df("wos.bib", dbsource = "isi", format = "bibtex") Database = mergeDbSources(S, W, remove.duplicated = TRUE) dim(Database) # install.packages("openxlsx") # if you don't have it installed library(openxlsx) write.xlsx(Database, file = "database.xlsx")."
```

References

- Acioli, Carina, Annibal Scavarda, and Augusto Reis. 2021. Applying Industry 4.0 Technologies in the COVID-19 Sustainable Chains. *International Journal of Productivity and Performance Management* 70: 988–1016. [\[CrossRef\]](#)
- Aria, Massimo, and Corrado Cuccurullo. 2017. Bibliometrix: An R-Tool for Comprehensive Science Mapping Analysis. *Journal of Informetrics* 11: 959–75. [\[CrossRef\]](#)
- Barakat, Ahmed, and Khaled Hussainey. 2013. Bank Governance, Regulation, Supervision, and Risk Reporting: Evidence from Operational Risk Disclosures in European Banks. *International Review of Financial Analysis* 30: 254–73. [\[CrossRef\]](#)
- Barakat, Ahmed, Anna Chernobai, and Mark Wahrenburg. 2014. Information asymmetry around operational risk announcements. *Journal of Banking & Finance* 48: 152–79.
- Broadus, R. N. 1987. Toward a Definition of "Bibliometrics". *Scientometrics* 12: 373–79. [\[CrossRef\]](#)
- Bui, Tat Dat, Mohd Helmi Ali, Feng Ming Tsai, Mohammad Iranmanesh, Ming-Lang Tseng, and Ming K Lim. 2020. Challenges and Trends in Sustainable Corporate Finance: A Bibliometric Systematic Review. *Journal of Risk and Financial Management* 13: 264. [\[CrossRef\]](#)
- Carnevale, Joel B., and Isabella Hatak. 2020. Employee Adjustment and Well-Being in the Era of COVID-19: Implications for Human Resource Management. *Journal of Business Research* 116: 183–87. [\[CrossRef\]](#) [\[PubMed\]](#)
- Chang, Chia-Lin, Michael McAleer, and Wing-Keung Wong. 2020. Risk and Financial Management of COVID-19 in Business, Economics and Finance. *Journal of Risk and Financial Management* 13: 102. [\[CrossRef\]](#)
- Chaudhury, Mo. 2010. A review of the key issues in operational risk capital modeling. *The Journal of Operational Risk* 5: 37. [\[CrossRef\]](#)
- Chernobai, Anna, Philippe Jorion, and Fan Yu. 2011. The Determinants of Operational Risk in U.S. Financial Institutions. *Journal of Financial and Quantitative Analysis* 46: 1683–725. [\[CrossRef\]](#)
- Choi, Tsan-Ming. 2020. Supply Chain Financing Using Blockchain: Impacts on Supply Chains Selling Fashionable Products. *Annals of Operations Research* 331: 393–415. [\[CrossRef\]](#)
- Delis, Manthos, Maria Iosifidi, and Mike G. Tsionas. 2017. Endogenous bank risk and efficiency. *European Journal of Operational Research* 260: 376–87. [\[CrossRef\]](#)
- Dellana, Scott, John F. Kros, Mauro Falasca, and William J. Rowe. 2019. Risk Management Integration and Supply Chain Performance in ISO 9001-Certified and Non-Certified Firms. *International Journal of Productivity and Performance Management* 69: 1205–25. [\[CrossRef\]](#)
- Fetscherin, Marc, and Daniel Heinrich. 2015. Consumer Brand Relationships Research: A Bibliometric Citation Meta-Analysis. *Journal of Business Research* 68: 380–90. [\[CrossRef\]](#)

- Fiordelisi, Franco, Maria-Gaia Soana, and Paola Schwizer. 2013. The determinants of reputational risk in the banking sector. *Journal of Banking & Finance* 37: 1359–71. [CrossRef]
- Fraginiere, Emmanuel, Jacek Gondzio, and Xi Yang. 2010. Operations risk management by optimally planning the qualified workforce capacity. *European Journal of Operational Research* 202: 518–27. [CrossRef]
- Gatzert, Nadine, Joan T. Schmit, and Andreas Kolb. 2016. Assessing the risks of insuring reputation risk. *Journal of Risk and Insurance* 83: 641–79. [CrossRef]
- Gillet, Roland, Georges Hübner, and Severine Plunus. 2010. Operational risk and reputation in the financial industry. *Journal of Banking & Finance* 34: 224–35. [CrossRef]
- Ginena, Karim. 2014. Sharī‘ah risk and corporate governance of Islamic banks. *Corporate Governance* 14: 86–103. [CrossRef]
- Goel, Pooja, Aashish Garg, Nidhi Walia, Rajwinder Kaur, Mehak Jain, and Simarjeet Singh. 2022. Contagious diseases and tourism: A systematic review based on bibliometric and content analysis methods. *Quality & Quantity* 56: 3085–110.
- Grundke, Peter. 2010. Top-down approaches for integrated risk management: How accurate are they? *European Journal of Operational Research* 203: 662–72. [CrossRef]
- Hafiz, Waqas Kamran, Abdelnaser Omran, and Shamsul Bahrain Mohamed-Arshad. 2019. Risk management, capital adequacy and audit quality for financial stability: Assessment from commercial banks of Pakistan. *Asian Economic and Financial Review* 9: 654.
- Hines, Chris S., and Gary F. Peters. 2015. Voluntary risk management committee formation: Determinants and short-term outcomes. *Journal of Accounting and Public Policy* 34: 267–90. [CrossRef]
- Jadwani, Barkha, and Shilpa Parkhi. 2021. Operational Risk Management: Analysis of Challenges Faced by Banks in India. *International Journal of Integrated Supply Management* 14: 183. [CrossRef]
- Khanra, Sayantan, Amandeep Dhir, and Matti Mäntymäki. 2020. Big data analytics and enterprises: A bibliometric synthesis of the literature. *Enterprise Information Systems* 14: 737–68. [CrossRef]
- Khanra, Sayantan, Amandeep Dhir, Vinit Parida, and Marko Kohtamäki. 2021. Servitization research: A review and bibliometric analysis of past achievements and future promises. *Journal of Business Research* 131: 151–66. [CrossRef]
- Leo, Martin, Suneel Sharma, and Koilakuntla Maddulety. 2019. Machine Learning in Banking Risk Management: A Literature Review. *Risks* 7: 29. [CrossRef]
- Mahadevan, Kala, and Sujata Joshi. 2021. Omnichannel retailing: A bibliometric and network visualization analysis. *Benchmarking: An International Journal* 29: 1113–36. [CrossRef]
- Masood, Omar, and John Fry. 2012. Risk Management and Basel-Accord-Implementation in Pakistan. *Journal of Financial Regulation and Compliance* 20: 293–306. [CrossRef]
- McAleer, Michael. 2020. Prevention Is Better Than the Cure: Risk Management of COVID-19. *Journal of Risk and Financial Management* 13: 46. [CrossRef]
- McConnell, Patrick. 2013. Systemic operational risk: The LIBOR manipulation scandal. *Journal of Operational Risk* 8: 59–99. [CrossRef]
- Mohanty, Sagarika, Sudhansu Sekhar Nanda, Tushar Soubhari, Vishnu N S, Sthitipragyan Biswal, and Shalini Patnaik. 2023. Emerging Research Trends in Green Finance: A Bibliometric Overview. *Journal of Risk and Financial Management* 16: 108. [CrossRef]
- Nahar, Shamsun, Mohammad Azim, and Christine Jubba. 2016. The determinants of risk disclosure by banking institutions: Evidence from Bangladesh. *Asian Review of Accounting* 24: 426–44. [CrossRef]
- Nobanee, Haitham, Maryam Al Hajjar, Mehroz Nida Dilshad, Maitha Sulta Al Kuwaiti, and Anoud Abdulla Al Kaabi. 2023. Operational Risk: A Global Examination Based on Bibliometric Analysis. *Journal of Operational Risk*. 18, p. 1. Available online: <https://ssrn.com/abstract=4395191> (accessed on 4 May 2023).
- Nobanee, Haitham, Fatima Youssef Al Hamadi, Fatma Ali Abdulaziz, Lina Subhi Abukarsh, Aysha Falah Alqahtani, Shayma Khalifa AlSubaey, Sara Mohamed Alqahtani, and Hamama Abdulla Almansoori. 2021. A Bibliometric Analysis of Sustainability and Risk Management. *Sustainability* 13: 3277. [CrossRef]
- Oblakovic, G. 2013. Risk Management at the Strategic and Operational Levels of Swiss Banks: Current Status and Lessons Learned from the Subprime Crisis. Ph.D. thesis, University of St. Gallen, St. Gallen, Switzerland.
- Punjani, Krunal K., Kala Mahadevan, Angappa Gunasekaran, V. V. Kumar, and Sujata Joshi. 2022. Cloud Computing in Agriculture: A Bibliometric and Network Visualization Analysis. *Quality & Quantity* 57: 3849–83. [CrossRef]
- Queiroz, Rafael. 2022. How to Merge Scopus and Web of Science (WOS) Databases to Use on Bibliometrix or Mendeley YouTube. *YouTube*, July 9. Available online: <https://www.youtube.com/watch?v=chaDruIPs4U> (accessed on 4 April 2023).
- Raju, D. 2013. A Study on Operational Risk Management in Housing Finance Institutions. Ph.D. thesis, Canara Bank School of Management Studies, Bangalore University, Karnataka, India.
- Rehman, Khurram, Hadi Hassan Khan, Bilal Sarwar, Noor Muhammad, Wahab Ahmed, and Zia Ur Rehman. 2020. A multi-group analysis of risk management practices of public and private commercial banks. *The Journal of Asian Finance, Economics and Business (JAFEB)* 7: 893–904. [CrossRef]
- Rejeb, Abderahman, Steve Simske, Karim Rejeb, Horst Treiblmaier, and Suhaiza Zailani. 2020. Internet of Things Research in Supply Chain Management and Logistics: A Bibliometric Analysis. *Internet of Things* 12: 100318. [CrossRef]
- Ruiz-Real, José Luis, Juan Uribe-Toril, Jaime De Valenciano, and Juan Carlos Gázquez-Abad. 2018. Worldwide Research on Circular Economy and Environment: A Bibliometric Analysis. *International Journal of Environmental Research and Public Health* 15: 2699. [CrossRef] [PubMed]

- Safiullah, Md, and Abul Shamsuddin. 2018. Risk in Islamic banking and corporate governance. *Pacific-Basin Finance Journal* 47: 129–49. [CrossRef]
- Sahoo, Pravakar, and Ashwani. 2020. COVID-19 and Indian Economy: Impact on Growth, Manufacturing, Trade and MSME Sector. *Global Business Review* 21: 1159–83. [CrossRef]
- Saputra, Moch Panji Agung, Sukono, and Diah Chaerani. 2022. Estimation of maximum potential losses for digital banking transaction risks using the extreme value-at-risks method. *Risks* 10: 10. [CrossRef]
- Sarkis, Joseph. 2020. Supply Chain Sustainability: Learning from the COVID-19 Pandemic. *International Journal of Operations & Production Management* 41: 63–73. [CrossRef]
- Shair, Faluk, Sun Shaorong, Hafiz Waqas Kamran, Muhammed Sajjad Hussain, Muhammad Atif Nawaz, and Van Chien Nguyen. 2021. Assessing the efficiency and total factor productivity growth of the banking industry: Do environmental concerns matters? *Environmental Science and Pollution Research* 28: 20822–38. [CrossRef]
- Sharma, Amalesh, Anirban Adhikary, and Sourav Bikash Borah. 2020a. COVID-19's Impact on Supply Chain Decisions: Strategic Insights from NASDAQ 100 Firms Using Twitter Data. *Journal of Business Research* 117: 443–49. [CrossRef]
- Sharma, Piyush, Tak Yan Leung, Russel P. J. Kingshott, Nebojsa S. Davcik, and Silvio Cardinali. 2020b. Managing Uncertainty during a Global Pandemic: An International Business Perspective. *Journal of Business Research* 116: 188–92. [CrossRef]
- Siao, Hung-Jung, Sue-Huai Gau, Jen-Hwa Kuo, Ming-Guo Li, and Chang-Jung Sun. 2022. Bibliometric Analysis of Environmental, Social, and Governance Management Research from 2002 to 2021. *Sustainability* 14: 16121. [CrossRef]
- Sound Practices for the Management and Supervision of Operational Risk Basel Committee on Banking Supervision. The Bank for International Settlements, February 2003. Available online: <https://www.bis.org/> (accessed on 4 April 2023).
- Sun, Lei, and Tzu-Pu Chang. 2011. A Comprehensive Analysis of the Effects of Risk Measures on Bank Efficiency: Evidence from Emerging Asian Countries. *Journal of Banking & Finance* 35: 1727–35.
- Torri, Gabriele, Rosella Giacometti, and Sandra Paterlini. 2018. Robust and sparse banking network estimation. *European Journal of Operational Research* 270: 51–65. [CrossRef]
- Uddin, Md Hamid, Md Hakim Ali, and Mohammad Kabir Hassan. 2020. Cybersecurity hazards and financial system vulnerability: A synthesis of literature. *Risk Management* 22: 239–309. [CrossRef]
- Ullah, Rahmat, Ikram Asghar, and Mark G. Griffiths. 2023. An Integrated Methodology for Bibliometric Analysis: A Case Study of Internet of Things in Healthcare Applications. *Sensors* 23: 67. [CrossRef] [PubMed]
- Van Eck, Nees Jan, and Ludo Waltman. 2010. Software Survey: VOSviewer, a Computer Program for Bibliometric Mapping. *Scientometrics* 84: 523–38. [CrossRef] [PubMed]
- Verma, Surabhi, and Anders Gustafsson. 2020. Investigating the Emerging COVID-19 Research Trends in the Field of Business and Management: A Bibliometric Analysis Approach. *Journal of Business Research* 118: 253–61. [CrossRef]
- Wang, Ke, Wei Huang, Jie Wu, and Ying-Nan Liu. 2014. Efficiency Measures of the Chinese Commercial Banking System Using an Additive Two-Stage DEA. *Omega* 44: 5–20. [CrossRef]
- Wang, Tawei, and Carol Hsu. 2013. Board composition and operational risk events of financial institutions. *Journal of Banking & Finance* 37: 2042–51.
- Wu, Desheng, and David L. Olson. 2010. Enterprise Risk Management: Coping with Model Risk in a Large Bank. *Journal of the Operational Research Society* 61: 179–90. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.