

Model-Based Approaches to Customer Churn Perspective: Bibliometric Analysis

Dr. Abdelghani Bouras and Mr. Abdulrahman Alosaimi

Professor of Industrial Engineering, Master of Engineering and Systems Management Candidate
Alfaisal University
Riyadh, Riyadh, KSA
abouras@alfaisal.edu, adalosaimi@alfaisal.edu

Abstract

This study conducts a comprehensive bibliometric examination to analyze Model-Based Customer Churn Research. Through Scopus, PRISMA, and VOSviewer. last two decades, academic publications and interest have increased. Empirical research, growth, and trends are examined in this paper. Evidence suggests churn prediction models using advanced data analytics, machine learning, and industry-specific methods. This shows scientific collaboration to predict industry churn. The study highlights "Expert Systems with Applications" and "ACM International Conference Proceedings Series," which spurred field dialogue. These publications provide cutting-edge research and expert opinions. Geographically, we study China, India, and the US. Global churn research matters. Bibliometric research shows model-based customer churns evolve. The resource can help academic and business researchers develop innovative client retention methods in different markets. By analyzing Model-Based Customer Churn the research studies, growth, and trends are examined. Evidence suggests churn prediction models use advanced data analytics, machine learning, and industry-specific methods. This shows scientific collaboration to predict industry churn. The study highlights "Expert Systems with Applications" and "ACM International Conference Proceedings Series," which spurred field dialogue. These publications provide cutting-edge research and expert opinions. Geographically, we study China, India, and the US. Global churn research matters. Bibliometric research shows that model-based customer churns evolve. The resource significantly assists academic and business researchers in developing innovative client retention methods in different markets.

Keywords

Model-Based Approaches, Customer Churn, a bibliometric analysis

1. Introduction

Understanding customer behavior is important for ensuring the growth and sustainability of an organization in today's dynamic business environment. In this environment, the concept of customer churn has attracted significant attention, prompting businesses to emphasize not just acquiring new customers but also retaining existing ones. This paper does a comprehensive bibliometric analysis of Model-Based Approaches to Customer Churn, a crucial area of investigation in customer relationship management, to put light on its complexity.

Customer churn model-based approaches are an essential convergence of customer relationship management, predictive modelling, and data analytics. In an age when client acquisition and retention are of equal importance, these methodologies provide organizations with sophisticated instruments to comprehend, forecast, and alleviate customer attrition. By employing a diverse range of analytical models, including basic statistical techniques and sophisticated machine learning algorithms, these methodologies empower organizations to derive significant insights from customer data, predict potential customer attrition, and formulate focused strategies to bolster customer loyalty (Burez and Van den Poel, 2009).

A prominent worry across all businesses is customer churn, which refers to the occurrence when clients terminate their association with a particular organization. Given the tendency for client acquisition to be more costly than customer retention, this may have a direct effect on a company's revenue and raise operational expenses (Griffin, 1997). A steady customer base and the long-term viability of a firm are contingent upon the capacity to identify the elements that lead to customer churn and to anticipate churn occurrences with precision (Lemmens and Croux, 2006). Therefore, this bibliometric study offers a crucial contribution to academia and business. This publication serves as a link between theory and practice in the realm of customer churn, emphasizing the dynamic patterns, significant advancements, and prospective developments within this critical field of research. In the face of intensifying market competition and the ongoing difficulty of retaining customers, the findings of this investigation provide organizations with a strategic guide for making well-informed choices and managing client relationships efficiently. examines the development and influence of scholarly inquiry in this field, providing an all-encompassing survey of the academic milieu pertaining to customer churn models. An examination of publishing patterns, major journals, notable authors, and renowned research institutes yields significant information into the status of research in the given topic. In addition to providing a comprehensive overview of the current body of literature, it also highlights prospective avenues and prospects within the realm of customer churn research (Hadden et al., 2007). Thus, the following questions are going to be investigated:

1. What is the distribution of Model-Based Approaches to Customer Churn publications in the years 2002–2023?
2. What is the most relevant journal Model-Based Approaches to Customer Churn research area?
3. What is the most relevant authors Model-Based Approaches to Customer Churn research area?
4. What are the most significant Geographical distribution in Model-Based Approaches to Customer Churn research area?
5. What are the primary research Trends and keywords for Model-Based Approaches to Customer Churn research area?

2. Literature Review and Bibliometric Analysis

This bibliometric study offers a crucial contribution to academia and business. This publication serves as a link between theory and practice in the realm of customer churn, emphasizing the dynamic patterns, significant advancements, and prospective developments within this critical field of research. In the face of intensifying market competition and the ongoing difficulty of retaining customers, the findings of this investigation provide organizations with a strategic guide for making well-informed choices and managing client relationships efficiently. examines the development and influence of scholarly inquiry in this field, providing an all-encompassing survey of the academic milieu pertaining to customer churn models. An examination of publishing patterns, major journals, notable authors, and renowned research institutes yields significant information into the status of research in the given topic. In addition to providing a comprehensive overview of the current body of literature, it also highlights prospective avenues and prospects within the realm of customer churn research (Hadden et al., 2007).

Further elaboration on the intricacies of this process may be seen in Figure 1. The selected subjects used in this bibliometric research were "Customer Churn Model-Based Approaches "Customer Churn Model-Based Approaches." The query "TITLE-ABS-KEY (customer AND churn AND models)" was employed. Utilizing the Scopus database, studies were retrieved for evaluation. The data selection for this bibliometric analysis method was conducted utilizing the PRISMA statement, as seen in Figure 1. In accordance with the PRISMA identification phase, entries in the database were first identified using the "Customer Churn" and "Model" keywords. In order to enhance the precision of the search, additional keywords were incorporated, such as "Customer Churns," "Churn Predictions," "Sales," "Churn," or "Learning AI"; "Customer Churns"; "Customer Churn Predictions"; "Customer Churns"; "Customer Churns"; "Customer Churns"; "Customer Churns"; "Learning AI (EXACTKEYWORD, "Forecasting"). Additionally, the language setting was restricted to English exclusively (LIMIT-TO (LANGUAGE, "English language"). The publishing year restrictions were as follows: AND PUBYEAR > 2002 AND PUBYEAR < 2024 AND, which included the time span from 2002 to 2023. 1,364 documents were discovered due to this search. After the screening procedure, 870 papers remained from the first findings. Studies published before the screening procedure in 2024 and publications restricted to conference papers or articles were omitted. AND (LIMIT-TO (SRCTYPE, "p") OR LIMIT-TO (SRCTYPE, "j")), for example.

The process continued with eligibility screening, which reduced the number of documents to 870 after removing full articles that were not in English. A software tool called VOS viewer was used to conduct data analysis and

visualization. As explained by Soegoto et al. (2022), VOS viewer can effectively analyze and visualize bibliometric data analysis. Figure 1 illustrates the PRISMA framework of this study.

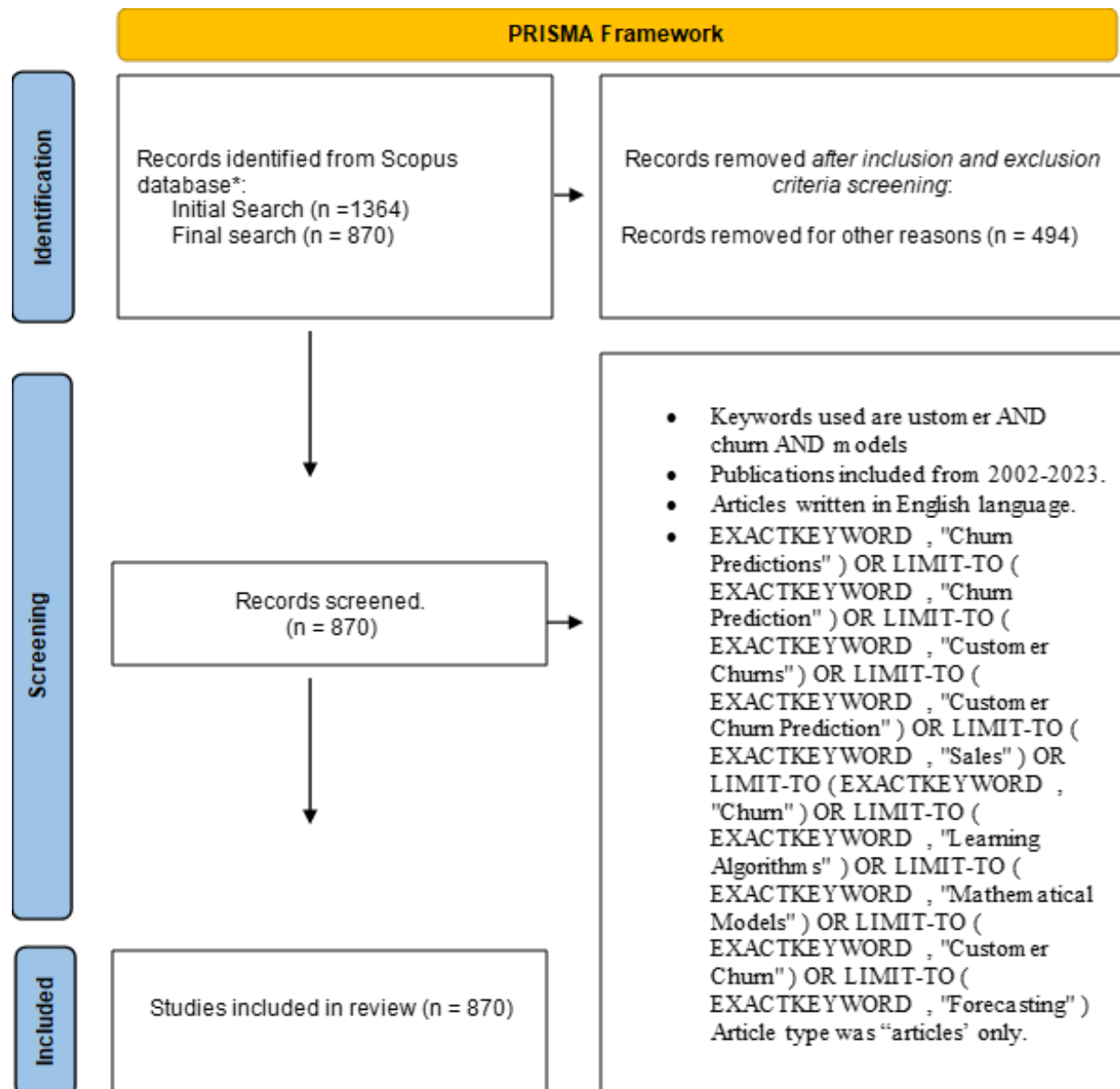


Figure 1: PRISMA Framework

1. What is the distribution of Model-Based Approaches to Customer Churn publications in the years 2002–2023?

The examination of Model-Based Approaches to Customer Churn has attracted considerable interest in the business and academic worlds in recent times. The study literature in this pivotal domain, which is essential for comprehending corporate strategy and customer retention, has been published in a diverse array during the last twenty years. A comprehensive examination of the distribution spanning the years 2002 to 2023 reveals astute tendencies and patterns that mirror the progressive development and fascination in this field of inquiry.

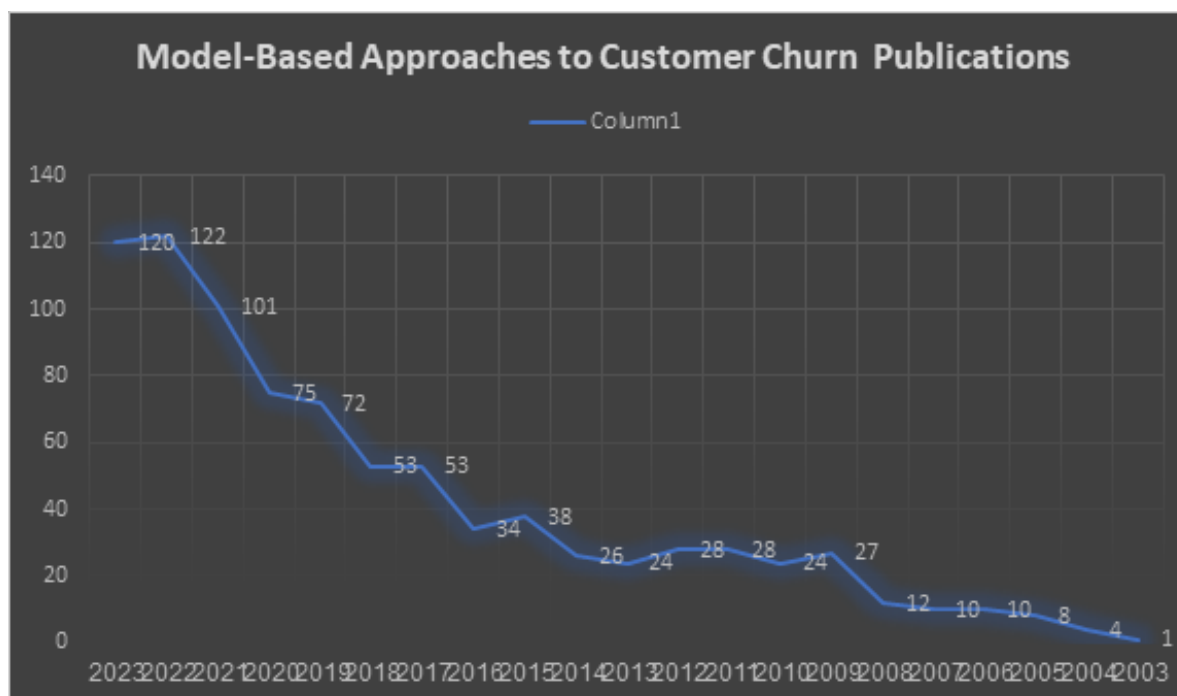


Figure 2: The distribution of Model-Based Approaches to Customer Churn publications in the years 2002–2023

An evident increase trend in the distribution of publications pertaining to Model-Based Approaches to Customer Churn can be seen from 2002 to 2023, as supported by bibliometric data. During its initial stages, the discipline received little academic interest, as seen by the solitary publication in 2003. Subsequently, this number grew to four in 2004, and it remained stable until 2007. Significant changes were place after 2007, as the number of publications increased steadily and peaked at double digits in 2008. The aforementioned ascent gained further prominence during the subsequent decade, culminating in a substantial surge to 34 publications in 2016. The production remained stable between 2017 and 2019, averaging between 53 and 72 articles year. Nevertheless, the most notable increase was identified during the last three years of the examination: 2021 saw the publishing of 101 works, which was followed by a peak of 122 in 2022, and 2023 saw the continuation of a high volume with 120 publications. This pattern reflects the increasing scholarly and applied attention towards the field of Model-Based Approaches to Customer Churn, underscoring its expanding significance in the present-day corporate environment. A visual representation of the publication distribution of Model-Based Approaches to Customer Churn from 2002 to 2023 may be shown in Figure 2.

2. What is the most relevant journal Model-Based Approaches to Customer Churn research area?

Practitioners and scholars alike must ascertain which publications are the most prominent around model-based approaches to customer churn. This process facilitates not only the identification of primary information sources but also the comprehension of the development and present patterns within this field of study. The identification of the primary publications that have made substantial contributions to the discussion and advancement of customer churn tactics is accomplished via bibliometric analysis; each of these journals has a distinct influence and scope within the academic community. Journals most pertinent to the Model-Based Approaches to Customer Churn study topic are listed in Table 1.

Table 1: The most relevant journals Model-Based Approaches to Customer Churn research area

#	Journal name	TP	TC	Cite score (2022)	Most cited article	Times cited	Publisher
1	Expert Systems with Applications	4897	61737	12.6	Reptile Search Algorithm (RSA): A nature-inspired meta-heuristic optimizer	626	Elsevier
2	ACM International Conference Proceeding Series	54524	49408	1.1	The robots are coming: Exploring the implications of OpenAI codex on introductory programming	67	Association for Computing Machinery
3	International Journal of Advanced Computer Science and Applications	4553	9537	2.1	Breast Cancer Detection and Classification using Deep Learning Xception Algorithm	33	Science and Information Organization
4	IEEE Access	45351	490387	9	A Metaverse: Taxonomy, Components, Applications, and Open Challenges	493	IEEE
5	European Journal of Operational Research	2589	28886	11.2	Machine learning at the service of meta-heuristics for solving combinatorial optimization problems: A state-of-the-art	120	Elsevier
6	Decision Support Systems	448	5589	12.5	Big arena, small potatoes: A mixed-methods investigation of atmospheric cues in live-streaming e-commerce	40	Elsevier
7	Journal of Physics: Conference Series	95458	90910	1	Anti-Corrosive Potential of the Sustainable Corrosion Inhibitors Based on Biomass Waste: A Review on Preceding and Perspective Research	21	IOP Publishing
8	Procedia Computer Science	7928	31982	4	A Deep Learning based model for the Detection of Pneumonia from Chest X-Ray Images using VGG-16 and Neural Networks	43	Elsevier
9	Neural Computing and Applications	4093	41031	10	Prairie Dog Optimization Algorithm	168	Springer Nature
10	Proceedings of SPIE - The International Society for Optical Engineering	47451	33336	0.7	Broadband Vector Vortex Coronagraph Testing at NASA's High Contrast Imaging Testbed Facility	18	SPIE

The bibliometric examination of the most relevant journals in the domain of Model-Based Approaches to Customer Churn reveals, as shown in Table 1, a wide variety of publications, many of which make substantial contributions to the subject. At the apex of the list is Elsevier's "Expert Systems with Applications," which is renowned for its

substantial cite score of 12.6 and a substantial overall citation count of 61,737. The publication entitled "Reptile Search Algorithm (RSA): A nature-inspired meta-heuristic optimizer" has garnered 626 citations, demonstrating its substantial influence within the field. The "ACM International Conference Proceeding Series," which has received 49,408 citations and has a cite score of 1.1, is a publication of the Association for Computing Machinery that is in close vicinity. The 67 citations for the article "The robots are coming: Exploring the Implications of OpenAI Codex on Introductory Programming" highlight the relevance of the journal.

The "International Journal of Advanced Computer Science and Applications," published by the Science and Information Organization, is renowned for its 9,537 citations and 2.1 cite score. Among its articles, the one that receives the most citations examines the application of deep learning in the diagnosis of breast cancer. The article titled "A Metaverse: Taxonomy, Components, Applications, and Open Challenges," published by IEEE Access, highlights the journal's relevance by its substantial citation and cite count of 9 and 493 references. Elsevier's "Decision Support Systems" and "European Journal of Operational Research" are regarded as scholarly publications that provide significant contributions, as shown by their respective citation counts of 11.2 and 12.5.

Additionally, the "Proceedings of SPIE – The International Society for Optical Engineering," "Procedia Computer Science," and "Neural Computing and Applications" published by Elsevier and Springer Nature, respectively, are noteworthy journals. "Journal of Physics: Conference Series" is published by IOP Publishing. Every journal, due to its distinct emphasis and substantial citation counts, is of the utmost importance in furthering knowledge and research in the field of customer churn.

3. What is the most relevant authors Model-Based Approaches to Customer Churn research area?

Within the ever-changing domain of Model-Based Approaches to Customer Churn, several writers have established themselves as seminal personalities, making substantial contributions via their scholarly investigations and published works. The writers, who originate from various institutional and geographic contexts, have significantly influenced comprehension and approaches to customer churn study. A bibliometric study identifies and emphasizes these people by assessing their influence on the discipline by their academic publications, aggregate citations, and h-index rankings. In addition to demonstrating their skill, their contributions highlight the collaborative and international aspect of this field of study. The most relevant writers in the Model-Based Approaches to Customer Churn study domain are included in Table 2.

Table 2: The most relevant authors Model-Based Approaches to Customer Churn research area

#	Author	Year of 1st publication	TP	h-Index	TC	Current affiliation	Country
1	Baesens, Bart M.M.	2000	228	56	12,100	KU Leuven, 3000 Leuven, Belgium	Belgium
2	Verbeke, Wouter	2008	63	22	2,017	KU Leuven, 3000 Leuven, Belgium	Belgium
3	Coussement, Kristof	2008	58	22	2,170	Lille Économie Management (LEM), Lille, France	France
4	Van Den Poel, Dirk Van	1996	147	44	6,450	Universiteit Gent, Ghent, Belgium	Belgium
5	Xiao, Jin	2009	85	22	1,376	Business School of Sichuan University, Chengdu, China	China
6	Amin, Adnan	2013	36	13	777	Institute of Management Sciences, Peshawar, Pakistan	Pakistan
7	Anwar, Sajid	2009	75	17	1,147	Institute of Management Sciences, Peshawar, Pakistan	Pakistan
8	Awang, Mohd Khalid	2012	35	5	151	niversiti Sultan Zainal Abidin, Terengganu, Malaysia	Malaysia
9	De Bock, Koen W.	2010	28	14	1,013	Audencia, Nantes, France	France
10	Khan, Asifullah Farhan	2002	242	42	7,569	Pakistan Institute of Engineering and Applied Sciences, Islamabad, Pakistan	Pakistan

The study domain of Model-Based Approaches to Customer Churn has been graced with the notable contributions of certain authors, as shown in Table 2. Prominent among the notable figures is Bart M.M. Baensens, a person associated with KU Leuven, Belgium, whose first publication occurred in 2000. His remarkable 228 total publications (TP) and h-index of 56 are substantiated by 12,100 total citations, which attest to his tremendous influence in the field (TC). Wouter Verbeke, an additional distinguished author associated with the same academic institution, has authored 63 publications since 2008. With an h-index of 22, Verbeke has received 2,017 citations.

Furthermore, worth mentioning are the noteworthy contributions made by Kristof Coussement from Lille Économie Management, France. Since 2008, he has authored 58 publications, which have amassed 2,170 citations and an h-index of 22. Dirk Van Den Poel, a distinguished academic associated with Universiteit Gent in Belgium, has made noteworthy advancements to the field since 1996. In addition to his 147 articles, he has accumulated an h-index of 44 and 6,450 citations. Since 2009, Jiao, an academic associated with the Business School of Sichuan University in China, has accumulated 85 papers, an h-index of 22, and 1,376 citations, all of which represent substantial advancements. Prominent contributions have been given by Adnan Amin and Sajid Anwar, both affiliated with the Pakistan Institute of Management Sciences. Anwar has written 75 papers since 2009, whilst Amin has contributed 36 publications since 2013. Their writings attest to the growing influence they have on the topic. Since 2012, Mohd Khalid Awang, an academic affiliated with Universiti Sultan Zainal Abidin in Malaysia, has made 35 publications. Since 2010, Koen W. De Bock, a native of Audencia, France, has authored 28 books. Finally, a notable contributor to the topic is Asifullah Farhan Khan, an employee of the Pakistan Institute of Engineering and Applied Sciences, who has authored 242 papers since 2002 and has an h-index of 42.

4. What are the most significant Geographical distribution in Model-Based Approaches to Customer Churn research area?

The research conducted around Model-Based Approaches to customer churn has attracted international interest, as seen by the dispersion of studies across different countries. This dissemination underscores the extensive global attention and varied viewpoints about customer turnover, hence underscoring the timeless applicability of this concept across numerous business environments. By analyzing the noteworthy contributions made by various nations, one may get a more comprehensive picture of the worldwide evolution of this field of study and identify the locations at the forefront of academic productivity. The most important geographic distribution in the Model-Based Approaches to Customer Churn study field is shown in Figure 3.

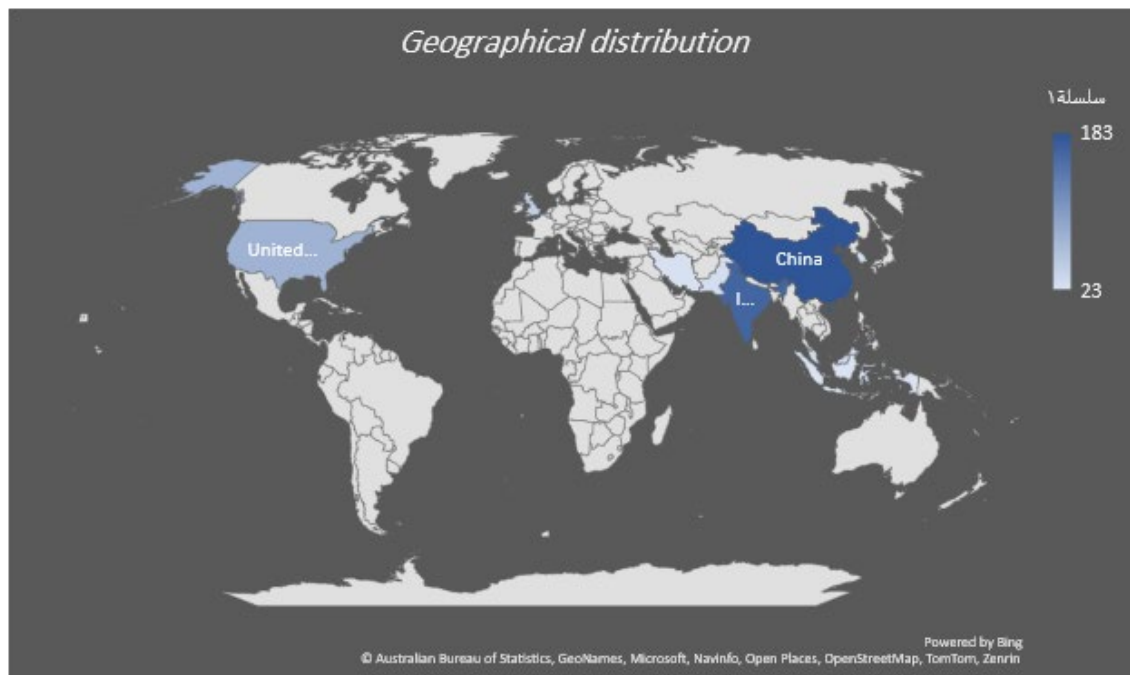


Figure 3: Map of the most significant Geographical distribution in Model-Based Approaches to Customer Churn research area

As seen in Figure 3. The analysis of research in Model-Based Approaches to Customer Churn shows a substantial international presence, with certain nations appearing as prominent contributors. With a noteworthy 183 publications, China emerges as the frontrunner in this distribution, emphasizing its significant contribution to the progress of this study field. India follows suit with 164 articles, which demonstrates the country's expanding scholarly focus and proficiency in the field of customer churn analysis. Furthermore, the United States has a prominent position in this subject, as seen by its 77 publications, which demonstrate its active engagement and research prowess. With 46 articles each, the United Kingdom and Belgium have a significant European presence in this field of study. These contributions underscore the significance of customer churn analysis within the corporate environments of both Europe and the West. Furthermore, significant contributions have been made by Malaysia, Pakistan, South Korea, Iran, and Indonesia, each with 32, 29, 29, 25, and 23 articles, respectively. The heterogeneous geographic distribution of these studies not only underscores the worldwide significance of customer churn research but also signifies the use of various viewpoints and methodologies across different regions.

5. What are the primary research Trends and keywords for Model-Based Approaches to Customer Churn research area?

The domain of Model-Based Approaches to Customer Churn is distinguished by many developing research trends, which mirror the ever-changing characteristics of customer behavior and the progress made in data analysis technology. Through the analysis of the most influential publications and keywords from many nations, it is possible to discern the principal research patterns in this field. These patterns reveal the most recent areas of emphasis and techniques being implemented on an international level; they give an overview of the most recent developments and developing concepts in customer churn research. The core research trends and keywords pertaining to the domain of model-based approaches to customer churn are shown in Table 3.

Table 3: The primary research Trends and keywords for Model-Based Approaches to Customer Churn research area

#	Country	Most relevant (Trends) article	TP
1	China	A strategic framework for a profitable business model in the sharing economy	183
2	India	A strategic framework for a profitable business model in the sharing economy	164
3	United states	A strategic framework for a profitable business model in the sharing economy	77
4	United Kingdom	New insights into churn prediction in the telecommunication sector: A profit driven data mining approach	46
5	Belgium	Churn prediction in subscription services: An application of support vector machines while comparing two parameter-selection techniques	44
6	Malaysia	A multi-layer perceptron approach for customer churn prediction	32
7	Pakistan	Comparing Oversampling Techniques to Handle the Class Imbalance Problem: A Customer Churn Prediction Case Study	29
8	South Korea	New insights into churn prediction in the telecommunication sector: A profit driven data mining approach	29
9	Iran	Developing a prediction model for customer churn from electronic banking services using data mining	25
10	Indonesia	Handling imbalanced data in customer churn prediction using combined sampling and weighted random forest	23

The important research trends and keywords in Model-Based Approaches to Customer Churn are represented in the most relevant papers from different nations, as shown in Table 3. A notable phenomenon, seen in the United States, China, and India, pertains to "A strategic framework for a lucrative company model in the sharing economy." This pattern indicates an emphasis on incorporating churn research into more comprehensive corporate frameworks, particularly within the expanding sharing economy. "New insights into attrition prediction in the telecoms sector: A profit-driven data mining strategy" is the current trend in the United Kingdom. This highlights the criticality of using

sophisticated data mining methods to improve churn forecasting in industries characterized by significant customer attrition, like telephony. All renders and keywords pertaining to the Model-Based Approaches to Customer Churn study domain are shown in Figure 4.

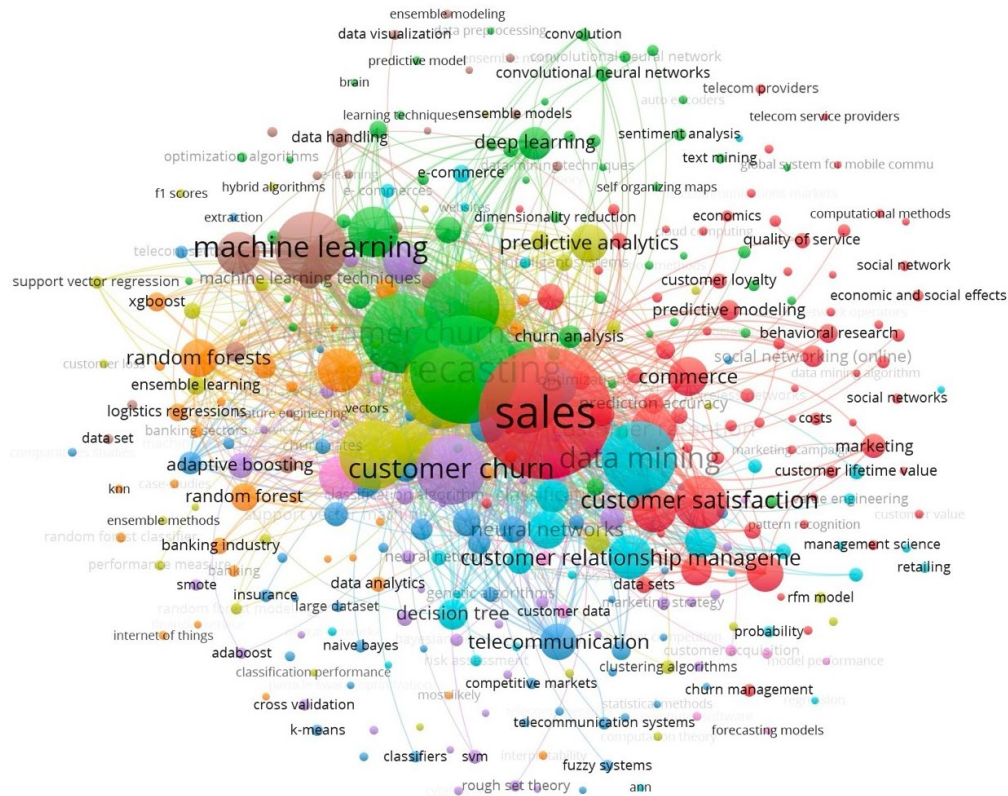


Figure 4: Overall trends and keywords in Model-Based Approaches to Customer Churn research area.

The article "Churn prediction in subscription services: An application of support vector machines while comparing two parameter-selection strategies" by Belgium emphasizes the implementation of support vector machines and other complex machine learning algorithms for churn prediction. This technique serves as an indication of the growing tendency in churn analysis to use increasingly intricate analytical tools. Malaysia's study is distinguished by the publication "A multi-layer perceptron technique for customer churn prediction," which suggests that neural network models may be used to comprehend client turnover. In a similar vein, Pakistan's focus on "A Customer Churn Prediction Case Study: Comparing Oversampling Techniques to Address the Class Imbalance Problem" draws attention to the difficulties associated with unbalanced datasets in churn prediction and the investigation into oversampling methodologies (Figure 5).

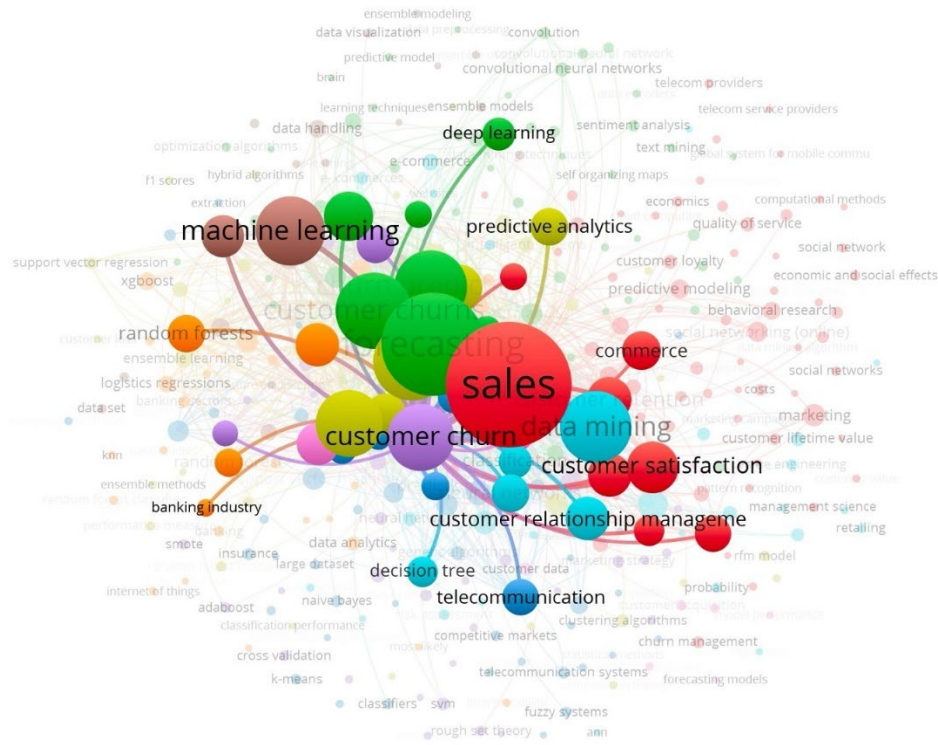


Figure 5: Trends and keywords in Model-Based Approaches to Customer Churn research area.

South Korea, like the United Kingdom, investigates novel approaches to forecasting customer turnover in the telecommunications industry. The paper "Developing a prediction model for customer churn from electronic banking services using data mining" by Iran emphasizes the significance of data mining in the banking industry by describing a sector-specific use of churn prediction models. In conclusion, the study conducted in Indonesia, titled "Managing Unbalanced Data in Customer Churn Prediction using Weighted Random Forest and Combined Sampling," highlights the use of sophisticated methods to rectify data imbalances in churn prediction models.

3. Conclusion

Model-Based Approaches to Customer Churn bibliometrics illuminates this field. From 2002 to 2023, many academic and applied papers worried about customer churn. Market changes and knowledge growth affect corporate strategy and consumer behavior. Scholars and businesses will study and use customer churn analysis in modern market dynamics. Top journals in this field publish important research. Academic papers shape discourse and reduce customer turnover. It recommends top customer churn research sources for practitioners and academics. Researchers in this field are intellectually complex. These interdisciplinary contributions have improved scholarly dialogue and advised global businesses for decades. They specialize in client retention after extensive writing and research. That prompted customer churn research. Customer churn research is applicable and diverse, as several international academic institutions have contributed. This global partnership improves client retention innovations and understanding. Modern corporations need customer churn research with far-reaching implications. Geographic distribution of study contributions shows global customer churn concerns. Academics from different fields explain customer churn and its effects in different markets to improve the subject. Global engagement helps academics and companies learn. This domain's research trends and keywords show a global push to improve churn prediction models. Researchers use advanced data analytics, machine learning, and sector-specific challenges to improve churn prediction accuracy and applicability. These trends show research status and prepare for advances. Organizations must adapt to consumer attrition in changing markets. The breadth and depth of model-based customer churn research concludes this bibliometric study. The field's multidisciplinary, global cooperation, and new methods are highlighted. This field is always relevant and dynamic because corporate environments and client churn management methods change.

4. Some of the Implications of the Bibliometric Analysis

- Scholarly and Investigative Advancement: This study provides a framework for further client attrition research. This emphasizes the need for multidisciplinary methods that combine business management, engineering, computer science, and decision sciences. Scholars are motivated to study these intersections because they may develop more comprehensive models and new churn prediction and management methods.
- Integration of AI and Technological Advancement: Computer science and engineering's impact on churn research suggests incorporating innovative technologies and AI into consumer churn models. This may spur the development of advanced, real-time analytic tools, helping organizations adapt to client behavior changes.
- The study highlights the importance of sector-specific churn research, especially in fast-changing industries like banking, e-commerce, and telecommunications. Sector-specific research can reveal customer habits and industry challenges, helping to improve churn avoidance methods.
- Enhancing Customer Understanding: Investigating customer turnover goes beyond predictive modeling to uncover loyalty, preferences, and satisfaction. These observations can help companies improve customer service, product innovation, and customer satisfaction. In summary, this bibliometric analysis of Model-Based Approaches to Customer Churn illuminates current scholarly inquiry and lays the groundwork for future academic and industrial advances. It influences academic work, technical progress, commercial strategy, and policymaking.

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Biographies

Dr. Abdulghani Boras Pr. Bouras holds a Ph.D., Master's, and Engineer of Operations Research. He is a Professor of Industrial Engineering at Al Faisal University, Riyadh. He was formerly a Professor of Industrial Engineering at Ecole Centrale Casablanca and King Saud University. He worked as an associate professor of operations management and quantitative methods at AUI and an assistant professor of production management at the School of Business and Management. He worked in the industry as an operations research analyst (steel industry), as a modeler-analyst (electricity producer), and finally as a consultant (Aluminum industry, healthcare, etc.). He is involved in many types of research published in IEEE, Springer. His areas of interest are Industry 4.0, mathematical modeling, operations research, operations and supply chain management, and intrusion detection systems. He has already reviewed many journal papers, books, Ph.D. and master's theses.

Abdulrahman Alosaimi is a Master of Engineering and Systems Management (MEM) candidate in Industrial Engineering Department at Alfaisal University, Riyadh, KSA. He earned B.S. in Electrical and Electronics Engineering from Al Imam Mohammad ibn Saud Islamic University 2019, Riyadh, KSA. Mr. Alosaimi has about 5 years' experience of technology and electronics systems bridging and industrialization at National Company of Mechanical Systems (NCMS) at Riyadh, KSA. His work interests include systems re-design for excellence, analytical analysis and simulations, optimization, processes development, and business planning. He is a member of IEOM, ICOSE.