A Systematic Literature Review and Meta- Analysis of AIML Experience in Banks

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Abstract

The prime concern of this research article is to engender the existing knowledge, trends and gaps in AIML in bank domains. Additionally, the article focuses on the applications of PSALSAR framework for conducting systematic literature review and meta- analysis of artificial intelligence (machine- learning) adoption in banks. Under the PSALSAR (Protocol, Screening, Appraisal, Synthesizing, Analysis and Reporting) framework PICOC (Population, Intervention, Comparison, Outcome and Context) method is also used to define the research scope. Although meta- analysis is useful for both the qualitative and quantitative content analysis, only the qualitative aspects are considered in this research article.

Keywords: AI, Credit Scoring, Machine Learning, PICOC, PSALSAR, SLR,

Introduction

AI is a key technological advancement that has replaced manual work with superior mental capacities and intellectual levels in almost the sectors (Chien et al., 2020). Corporations have demonstrated how their operations and business models have benefitted using AI. Besides the AI applications are equally promising for the banking sector. However, AI in banking sector has unequal practices and experiences mainly in backend services like; stock prediction and credit rating or credit scoring by credit card providers (Jadhav et al., 2016). The backend services are traditionally highly computerized. Eventually, chatbots and virtual assistants have enabled transactions and services that was no possible before; shortening the response time, along with creating convenience and

efficiency (Griol et al., 2013). Further, artificial intelligence uses machine learning to train the machines or systems in a way that they produce thinking like humans and perform the actions accordingly (Beetz et al., 2007).

In recent years, the banking industry has seen tremendous growth in the usage of artificial intelligence and machine learning (AIML). AIML has the potential to significantly transform the banking sector by increasing productivity, lowering costs, and improving customer experience. In particular, the influence of AIML on credit scoring, fraud detection, risk management, and customer service are the main topic of this research paper. In order to increase the accuracy of credit scoring, the study intends to pinpoint the key regions of banks where AIML is being used.

Review of related literature assessment is of utmost concern in research work of any discipline (Hart, 2018). But it's also equally essential to differentiate Systematic Literature Review (SLR) from a traditional narrative review of literature. Instantly, SLR relies on replicability, scientific and transparent procedures (Oxman & Guyatt, 1993). In broader sense, SLR is a systematic, explicit, and reproducible method for identifying, evaluating and synthesizing the existing body of knowledge completed and recorded work made by researchers, scholars and practitioners (Fernandez del Amo et al., 2018). The PSALSAR and PICOC frameworks will serve as the researchers' guides as they undertake a systematic literature review and meta-analysis. On the other hand, meta-analysis applies statistical techniques to derive results based on multiple related studies of data combination.

Very precisely, the researcher aims at satisfying the following enigmas in the field of AI:

a. What are the main business areas of banks in which AI is focused?
b. What is Credit Scoring and how machine learning techniques can be used in banking sector?

Theoretical Framework

There are several kinds of theoretical models that can be used for the systematic literature review of AI experience in banks. The major ones are Protocol, Search, Appraisal, Synthesis, Analysis and Reporting (PSALSAR) and Preferred Reporting Items for Systematic Reviews and Meta- Analyses (PRISM). The PSALSAR framework is selected for this research paper. The research framework of this research paper is presented below:

Table 1 : PSALSAR FRAMEWORK

	Steps	Main Task
PSALSAR Framework	Protocol	Defined study scope
	Search	Define the search strategy Search studies
	Appraisal	Selecting studies Quality assessment of studies
	Synthesis	Extract data Categorize data
	Analysis	Data Analysis, Results and Discussion, Conclusion
	Report	Report Writing, Journal Article Production

Source: (I.F. del Amo, A systematic review of Augmented Reality content-related techniques for knowledge transfer in maintenance applications, 2018)

The PSALSAR framework starts with establishment of research protocol and determination of study scope. According to Booth et al., the PICOC method should be supplemented to each stage of the PSALSAR framework in order to assure transparency and transferability of the study. PICOC provides a prescribed structure that is required to decompose research questions and improve the definition of the research scope.

Objectives of the Study

In order to inscribe the above research questions, this research paper focusses on generating the existing knowledge, trends and gaps of AI application in banks and create a knowledge base and the most comprehensive and up to date understanding of the current state of AIML implementation in the banking sector, by conducting a systematic literature review and meta-analysis of the available literature. The study aims to identify the primary areas of focus for AI in the banking sector and to investigate the concept of credit scoring, specifically how machine learning techniques can be used to enhance credit scoring accuracy. To sum up, the purposes of this research paper are as listed below:

- To present an analysis of the literature on AIML adoption in banking sector
- To investigate the concept of credit scoring.

Research Methodology

The search of literature and its analysis is entirely based on the PSALSAR framework. This approach has been employed in a systematic literature review on the existing knowledge and research gaps in AIML experience in banking sectors. PSALSAR framework of SLR applies six steps which is presented in the Table 2.

Table 2: THE FRAMEWORKs FOR SYSTEMATIC LITERATURE AND META- ANALYSIS

	Steps	Main Task and Method	Outcome
P S A L S A R Framework	Protocol	Define study scope	Indicators for measuring AIML Experience using PICOC method
	Search	Search for studies Selecting studies	Search databases with preselected keywords. Inclusion and exclusion criteria based on PRISMA statement (Papers identification, screening, Eligibility and Included papers).
	Appraisal	Quality assessment of studies	Snowballing technique
	Synthesis	Extract data	Template construction for data extraction
		Categorize data	Arranging data for further analysis
		Data analysis	Quantitative categories, description and narrative analysis of the organized data.
	Analysis	Result and discussion	Trend identification, Gap acknowledgement, and comparison of results
		Conclusion	Conclusion and recommendation
	Report	Conducting a report	Summary of results using PRISMA methodology

Source: Based on (I.F. del Amo, A systematic review of Augmented Reality content-related techniques for knowledge transfer in maintenance applications, 2018)

PSALSAR Framework triggers with the determination of research protocol and study scope. The details of all the steps of PSALSAR Framework is detailed below.

Method Details: Six Basic Steps:

Protocol – SLR Methodology Step 1

The "Protocol" is the first step in PSALSAR, which refers to the methodology of systematic literature review, and describes the rationale, hypothesis, and planned methods of the review. The PSALSAR method for conducting a systematic literature review and meta-analysis on the topic of AIML experience in banks involves writing a research protocol that outlines the need for transparency, transferability, and replicability of that work, and includes exhaustive literature searches to minimize bias (Mengist et al., 2019). The PICOC (Population, Intervention, Comparison, Outcomes, Context) framework is used to define the research protocol for this systematic literature review and meta-analysis. The use of PICOC framework provides a comprehensive overview of the existing literature on AIML implementation in the banking sector, identify gaps in the literature and generate insights into the potential impact of AIML on banking industry.

Table 3: SLR research scope based on the application of the PICOC framework to determine objectives

Concepts	SLR Application
Population	The population of interest for this study is banks that have implemented AIML in their operations.
Intervention	The intervention of interest is the implementation of AIML in the banking sector, including the use of machine learning algorithms, natural language processing, robot process automation, and other AI technologies.
Comparison	This study compares the effectiveness of AIML implementation in the banking sector to traditional methods and explore the impact of different approached and areas of AIML implantation.
Outcomes	The primary outcomes of interest for this study are the benefits and challenges of AIML implementation in the banking sector, including improved efficiency, reduced costs, enhanced customer experience, and potential risks such as privacy and security concerns.

Context	The context of interest for this study is the global banking industry, with a focus on large commercial banks. This study explores the current state of AIML implementation in various regions and countries and investigate the factors influencing the adoption and success of AIML in the banking sector.

Search – SLR Methodology Step 2

The thorough and exhaustive search of pertinent literature is performed in order to conduct a systematic literature review and meta-analysis of AIML experience in banks using the PSALSAR technique. The PSALSAR technique uses a thorough and organized search strategy to find pertinent studies that meet the pre-established eligibility requirements and can respond to the developed research questions. Following the search, the PSALSAR technique is used to screen the literature, rate the quality of the studies, extract data, and combine the findings to provide answers to the study's research questions. For the systematic literature review and meta-analysis to be thorough, objective, and repeatable, a rigid and well-defined search procedure must be used.

The following databases are used to conduct a thorough literature search:
- SCOPUS
- WEB OF SCIENCE
- GOOGLE SCHOLAR
- SCIENCEDIRECT

Based on the study questions, a combination of keywords and controlled vocabulary concepts is to be employed for the search terms. To guarantee the best results, the search words is customized for each database.

Only English-language articles released between 2010 and 2022 is included in the search. Peer-reviewed journal papers, conference transcripts, and book chapters are incorporated into the search.

The search will make use of the following search phrases and their variants:
"Artificial Intelligence" OR "Machine Learning" AND "Banking"
"AI" OR "ML" AND "Banking"
"Artificial Intelligence" OR "Machine Learning" AND "Finance"
"AI" OR "ML" AND "Finance"
"Credit Scoring" AND "Machine Learning"

"Fraud Detection" AND "Artificial Intelligence"

"Risk Management" AND "Machine Learning"

"Customer Service" AND "Artificial Intelligence"

There are two stages to the search. A preliminary search is done in the first stage to find pertinent keywords and terms. Using the chosen keywords and terms, a thorough search is done in the second step.

A reference management program receives the search results for filtering and selection. On the basis of their titles and abstracts, the remaining papers is examined after the duplicates have been eliminated. The full-text studies of the chosen studies are examined to determine their suitability for the systematic review.

Inclusion Standards:

- Studies examining the application of AI and/or ML in the banking industry
- Studies on the banking industry's credit scoring, fraud detection, risk management, and customer service
- English-language academic publications between 2010 and 2022
- Peer-reviewed studies published in book chapters, conference proceedings, and journal articles

Exclusion Standards:

- Studies unrelated to the banking industry
- Studies unrelated to machine learning and/or AI
- Studies that are not published in English Studies that are not book chapters, conference proceedings, or peer-reviewed journal articles

Table 4: The searching terms used and the total number of publications from each database.

Databases	Searching String and Searching Terms	No. of articles	Date of acquisition
Scopus	"Artificial Intelligence" OR "Machine Learning" AND "Banking"	71	3/5/2023
	"Artificial Intelligence" OR "Machine Learning" AND "Finance"	29	3/5/2023
	"Credit Scoring" AND "Machine Learning"	83	4/5/2023

	"AI" OR "ML" AND "Finance"	23	3/5/2023
Science Direct	"Risk Management" AND "Machine Learning"	16	4/5/2023
	"Customer Service" AND "Artificial Intelligence"	43	3/5/2023
Web of Science	"Credit Scoring" AND "Machine Learning"	19	3/5/2023
	"Artificial Intelligence" OR "Machine Learning" AND "Banking"	27	3/5/2023
Google Scholar	"Artificial Intelligence" OR "Machine Learning" AND "Finance"	77	4/5/2023
	"Risk Management" AND "Machine Learning"	41	4/5/2023
	"Credit Scoring" AND "Machine Learning"	12	3/5/2023

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart is used to record the search results.

Appraisal – SLR Methodology Step 3

In the appraisal step, the chosen publications were evaluated based on the review's objective. The literature selection process involved screening to identify relevant papers for the review. The two primary phases involved in the selection of studies are the application of inclusion criteria and quality assessment. Papers meeting the inclusion criteria were subjected to further research and content evaluations using predetermined criteria as outlined in Table 5. In this systematic review project, gray literature, extended abstracts, speeches, keynotes, review articles, and publications written in languages other than English were excluded.

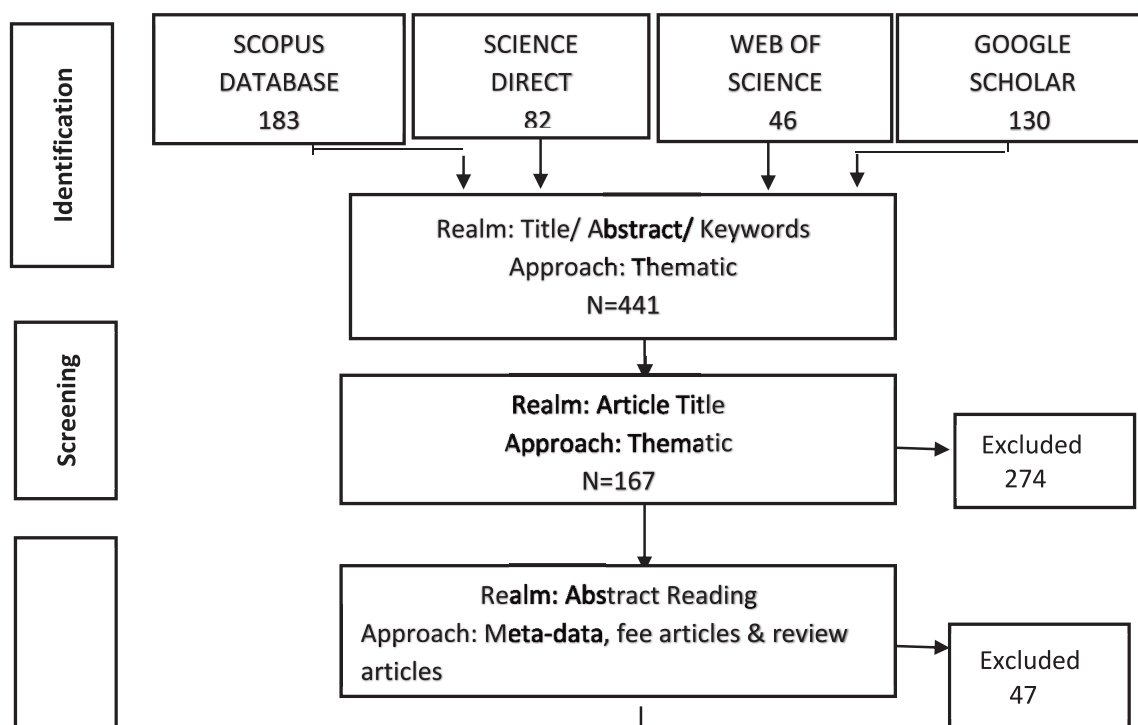*Table 5: SLR study selection of literature using inclusion and exclusion criteria.*

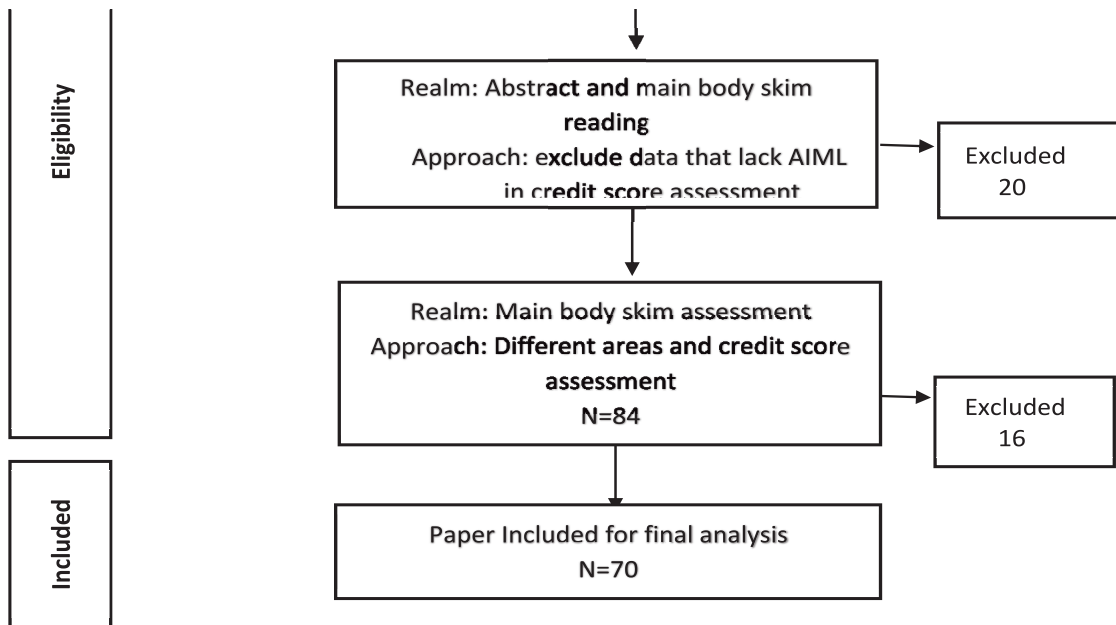| Criteria	Decision
When the predefined keywords exist as a whole or at least in title, keywords or abstract section of the paper.	Inclusion
The paper published in a scientific peer-reviewed journal	Inclusion
The paper should be written in the English language	Inclusion
Studies that present pieces of evidence on synergic/tradeoff studies	Inclusion
Papers that are duplicated within the search documents	Exclusion

Criteria	Decision
Papers that are not accessible, review papers and meta-data	Exclusion
Papers that are not primary/original research	Exclusion
Papers that got published before 2010	Exclusion

Synthesis – SLR Methodology Step 4

Figure. 1 displayed the general screening procedures and the order of picking pertinent material. Initially, a total of 441 records were discovered (183 from Scopus Database,82 from science direct, 46 from web of science, 130 from google scholar). The number of literary works was reduced to 167 articles preserved for further title reading after the exclusion of works such as gray literature, extended abstracts, presentations, keynotes, book chapters, non-English language papers, and inaccessible publications. Following that, only 120 articles met the requirements for additional abstract reading. Just 100 articles were left after reading the article abstracts to be read in full. 84 of them among them evaluated different areas of AIML used and credit score assessment, and these articles were downloaded for additional inspection. Duplicate papers and articles without precise evaluation techniques were manually deleted during main body reading. In the end, 74 publications were left that met every requirement for inclusion in this SLR effort.

Figure 1:The flow diagram for the database search of publications for systematic reviews

Eligibility

Realm: Abstract and main body skim reading
Approach: exclude data that lack AIML in credit score assessment
→ Excluded 20

Realm: Main body skim assessment
Approach: Different areas and credit score assessment
N=84
→ Excluded 16

Included

Paper Included for final analysis
N=70

The following criteria were utilized in the PSALSAR's synthesis section to extract information from the papers that were chosen:

- Research design: The kind of research methodology each publication employed, such as case studies, experiments, or observational research.
- Participants: Information on the individuals who took part in a study, such as their demographics, state of health, or other pertinent details.
- Intervention: The particular interventions utilized in each study, such as the kind of AI or ML technology used, the length of the intervention, and how often it occurs.
- Outcome measures: The primary and secondary outcome measures used in each study, such as accuracy of predictions, efficiency, or effectiveness of the AI or ML tool.
- Results: The key findings and recommendations from each study, along with any caveats or areas requiring additional study.
- Evaluation of each study's quality, including any potential bias or confounding variables, as well as the quality of the evidence that was provided.

In order to systematically collect pertinent data from the chosen publications and to synthesize the results of the literature review and meta-analysis in PSALSAR, these criteria were applied.

Analysis – SLR Methodology Step 5

The current application of artificial intelligence and machine learning (AIML) in the banking sector is the subject of this extensive review of the literature and meta-focus analyses. The papers were reviewed in accordance with the inclusion and exclusion criteria after being found using topic-related keywords in the search. 167 articles were screened in all, and 70 were picked for the final examination. The data extraction process included finding and eliminating relevant content from the selected publications. Based on predetermined parameters, the information is extracted. The findings of this comprehensive literature review and meta-analysis demonstrate that AIML has a major impact on the banking sector. According to the report, AIML is used in a variety of banking processes, including loan processing, customer support, and fraud detection. The report also addresses the advantages and difficulties of applying AIML to the banking industry.

According to the meta-analysis, using AIML in the banking industry increases precision, effectiveness, and client satisfaction. The ethical ramifications of deploying AI in the banking industry, particularly in relation to data privacy and security, are a matter of some concern.

The usefulness of AIML in credit scoring, particularly its capacity to precisely predict credit risk and lower the incidence of defaults, is one of the meta-significant analysis's conclusions. AIML adoption can also result in a credit scoring procedure that is more efficient, requiring less time and resources to review credit applications.

Overall, this comprehensive evaluation of the literature and meta-analysis sheds light on how AIML is now being used in the banking industry. Further research and the application of AIML in the banking sector can be guided by the study's findings.

Report – SLR Methodology Step 6

The description and presentation of the procedures used and the findings from the chosen literature are included in the report phase of SLR. Two steps make up this report phase: (i) description of the major technique followed, i.e., given in Figure 1 (ii) publication of the findings like a journal paper. The final phase in SLR is to produce a journal paper, which contributes to the research output needed for scientific applications.

Conclusion

Most often, systematic literature review is negligible in research papers although the need of systematic literature review is a prime concern. This article presented the steps that need to be deployed in conducting systematic literature review. The used method

PSALSAR is explicit and transferable procedure in SLR. The presented article has also deployed the meta- analysis as in effect this served producing specific existing knowledge in AIML adoption in banks, its trends and gaps observed in the AIML domains. This article is equally useful to the future researchers who are interested in conducting research in AI and other social sciences.

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