Digital Transformation in Commercial Banking: Trends, Challenges, and Future Directions

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ARTICLE INFO	ABSTRACT
Keywords: Retail Banking; Digital Transformation; Commercial Banks; Digitalization **Corresponding Author:** Dr. Ahsan Riaz **Email:** *Ahsanriaz@gcuf.edu.pk* *draraz8886@gmail.com* OPEN ACCESS	*This systematic literature review provides an in-depth exploration of digital transformation in commercial banking, with a focused emphasis on Scopus-indexed research articles. Employing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology, our investigation methodically navigated the extensive database to meticulously curate a final selection of 56 published articles composed in the English language. Through exacting screening processes and innovative data visualization techniques facilitated by VOS viewer, this systematic review aspired to delineate and showcase the thematic evolution within the literature on digital transformation in commercial banks. This review provides insights into the notable effects of emerging technologies like blockchain, artificial intelligence, and big data on how traditional banking practices, customer interactions, and risk evaluation are evolving, based on a detailed examination of 56 scholarly articles from the years 2019 to 2024. The analysis highlights the drivers of digital transformation, including evolving customer expectations, competition from FinTechs, regulatory mandates, and cost efficiency. The review underscores the prominence of journal-based research, with a focus on sustainability and finance-oriented themes, while identifying key geographical contributions and emerging topics like financial inclusion, innovation, and FinTech. This study offers a comprehensive synthesis of existing knowledge, providing a robust*

foundation for future research in digital transformation within commercial banking. This study stands as a valuable resource for scholars, practitioners, and policymakers alike who are keenly interested in the dynamic and evolving field of digitalization in retail banking.

Introduction

Digital transformation constitutes a fundamental catalyst for fostering innovation and enhancing competitiveness within the banking sector, particularly in the domains of retail and commercial banking. The term digital transformation denotes the thorough reorganization of conventional banking frameworks by incorporating digital tools throughout numerous business activities, operational systems, and methods of engaging clients. The predominant impetus for digital transformation within commercial and retail banking institutions encompasses the enhancement of operational efficiency, the preservation of competitive advantage in an increasingly dynamic technological landscape, and the provision of superior customer experiences. Traditionally, the service delivery mechanisms within the banking sector were heavily reliant on tangible infrastructure, including physical branches and manual operational processes. Still, the strategies that banks utilize have seen a major overhaul because of advancements in technology like blockchain, cloud platforms, AI tools, mobile solutions, and large-scale data processing (Bai et al., 2024). The industry has persistently evolved towards sophisticated digital ecosystems that facilitate real-time transactions, tailored services, and seamless channel integration, commencing with the advent of automated teller machines and internet banking during the late 20th century. The global proliferation of COVID-19 accelerated the shift towards digital transformation by underscoring the significance of digital channels. Both commercial and retail banks were necessitated to rapidly innovate to maintain service continuity amid social distancing protocols and lockdowns. Consequently, internet banking has eclipsed conventional means, with innovations like smartphone apps, contactless payments, and remote onboarding achieving significant appeal (Gergely Lóska & Juha Uotila, 2023).

Commercial and retail banks are experiencing digital changes due to the necessity of adapting to evolving market conditions, emerging technologies, and customer expectations. A primary catalyst for this transition is client expectations and contemporary banking clients seek efficiency, convenience, and personalized service. Through the utilization of digital technologies such as AI-driven platforms and mobile banking applications, banks are now able to offer tailored services, including predicted financial insights. These insights assist clients in optimizing their financial management. Customer satisfaction and loyalty are enhanced by tailored loan offers that reflect individual financial behaviors and preferences. Banks are under pressure to implement novel solutions to satisfy customers' need for instantaneous, individualized interactions. A significant aspect driving digital transformation is the fast advancement of new technology. Banking is undergoing a transformation due to emerging technologies such as big data, blockchain, and artificial intelligence (AI) (Jia & Liu, 2024). AI is improving fraud detection by analyzing transaction patterns and providing real-time reports on suspicious activities. Domains such as trade finance are reaping advantages from blockchain's enhanced transparency and expedited transaction settlements. Consequently, these technology improvements enable banks to provide their consumers enhanced and more reliable services by improving efficiency, augmenting security, and streamlining operations. A further driving reason is the competitive challenge presented by

FinTech enterprises and only online banks. These agile, technology-driven companies are challenging the traditional banking paradigm by offering innovative, rapid, and straightforward financial solutions. To preserve their market share and attract new clients, traditional banks must adopt digital solutions that are equivalent to or superior to those of their competitors. Financial firms are required to implement digital transformation in response to regulatory demands. Regulatory frameworks necessitating the augmentation of cybersecurity measures and the safeguarding of data are compelling financial institutions to upgrade their technological infrastructure and implement more secure, compliant digital solutions. Ultimately, a paramount motivating factor pertains to the quest for cost efficiency. Financial institutions can realize cost reductions by refining operational processes and minimizing manual intervention through the deployment of automation and digitalization methodologies. This not only bolsters overall profitability but also enhances customer satisfaction metrics (Porfírio et al., 2024).

Enhancing the efficacy and efficiency of intricate financial transactions constitutes a principal aim of digital transformation within commercial banking institutions. Trade financing, treasury operations, and corporate lending serve as illustrative domains that have historically necessitated substantial resources. The integration of cutting-edge technologies has optimized these processes, leading to diminished operational expenditures and a reduced likelihood of errors. In the realm of trade finance, blockchain technology emerges as a seminal innovation. A blockchain framework offers an exceptionally effective, transparent, and secure mechanism for tracking and documenting transactions via decentralized ledger technologies. This breakthrough has fundamentally altered trade finance by expediting the settlement of cross-border transactions, minimizing the reliance on paperwork, and eliminating the necessity for intermediaries. Blockchain technology promotes reliability and lessens the danger of scams by boosting clarity and giving all interested individuals access to the same instantaneous information. Moreover, transaction velocities are significantly enhanced, reducing processing durations from days or weeks to mere hours or minutes (Xie & Wang, 2023).

Digital transformation markedly enhances the management of cash and oversight of liquidity within treasury functions. Employing live data scrutiny, financial organizations can fortify their cash reserves, detect possible risk factors, and agilely revise their strategic tactics. The adoption of automated cash flow forecasting and scenario analysis tools can refine the decision-making processes for banking entities and their corporate clientele, thereby enabling a more proficient navigation of economic and market fluctuations. Commercial banks increasingly utilize data analytics and machine learning algorithms to enhance the assessment of credit risk in corporate lending. These technologies enable banks to enhance their comprehension of corporate clients' financial well-being by analyzing diverse financial data sets, including historical transactions and market conditions. This enables financial institutions to deliver customized loan offerings, enhance interest rate optimization, and make more educated decisions regarding credit allocations, ultimately leading to increased profitability and risk mitigation (Zhu Yongjie & Jin, 2023).

In response to the shifting requirements of modern consumers, retail banking institutions have emphasized the implementation of customer-oriented digital solutions. Systems based on chatbots for customer service, digital wallets, and mobile banking applications have emerged as essential instruments for improving accessibility, convenience, and personalization. These advancements empower consumers to conduct their banking activities according to their schedules, thereby removing the obligation to visit a physical branch. Mobile applications afford users the opportunity to engage in a seamless banking experience at their discretion, independent of time or geographical constraints. With minimal effort, individuals can check account balances, initiate money transfers,

submit loan applications, and track their spending patterns. Digital wallets, such as Apple Pay and Google Wallet, considerably enhance the financial transaction process and support the transition to cashless economies by enabling users to conduct secure monetary exchanges expeditiously through their mobile devices. Chatbots driving customer support elevate the overall experience for users by removing human interaction in standard questions and offering prompt replies to their concerns, thus ensuring help is always at hand (Khattak et al., 2023).

Regulatory frameworks such as PSD2 (Payment Services Directive 2) in Europe have catalyzed the development of open banking, considerably promoting innovation within the retail banking sector. Under open banking rules, banks must allow third-party providers to access consumer data, depending on customer consent, to promote the introduction of fresh financial products and services. This regulatory shift permits FinTech businesses and other financial institutions to collaborate and compete in delivering superior goods and services to clients. By amalgamating data from many accounts, TPPs may provide clients distinctive payment alternatives and customized financial management tools—capabilities that banks may not have conceived alone. Customers increasingly possess greater autonomy inside their financial ecosystems, and retail banks are not the exclusive providers of services (Hu, 2024).

Research Objective

This study's main goals are,

1. To examine the role of digital transformation in redefining commercial banking operations.
2. To identify and analyze the latest trends, journal, countries, citation patterns and author keywords related to digital transformation and commercial banking.

Methodology

Inclusion & Exclusion Criteria
The selection method for papers included in the review followed stringent criteria to assure relevance and quality, while explicitly stated rejection parameters refined the dataset by omitting non-essential or low-quality studies as mentioned in Table 1.

Table 1: Inclusion & Exclusion Criteria

Criteria for Acceptance	Criteria for Rejection
➢ Only papers with titles related to Digital Transformation, Commercial Bank and Retail Banks were selected. ➢ Only papers sourced from Scopus digital databases were considered ranging from inception to 2024.	➢ Non-English language article was excluded. ➢ Master's and doctoral theses, conference papers, reviews, reports, retracted articles, editorials, notes, short surveys, and unpublished working articles. ➢ Missing record papers were also excluded.

Acceptance Criteria
Submissions were approved according to their correspondence with designated theme areas pertinent to the research. Only papers with names expressly pertaining to Digital Transformation,

Commercial Banks, and Retail Banks were incorporated. This theme filter guaranteed that only research pertinent to the primary subjects was included, hence augmenting the review's relevancy. Furthermore, the data source was limited to the Scopus digital database, acknowledged for its extensive and high-caliber peer-reviewed literature. The evaluation ensured the inclusion of reputable and credible research by concentrating solely on publications acquired from Scopus.

Rejection Criteria

Various categories of publications were omitted to maintain the methodological integrity of the review. Initially, all non-English items were excluded to maintain linguistic consistency and facilitate analysis. Secondly, particular document kinds, such as master's and doctoral theses, conference papers, reviews, reports, retracted articles, editorials, notes, brief surveys, and unpublished working papers, were omitted. Such materials frequently lack the peer-reviewed rigor necessary for inclusion in systematic reviews, either because of their structure (e.g., editorials and notes) or their preliminary status (e.g., theses, working papers). This phase guaranteed that just mature, peer- reviewed research informed the final dataset. Papers with incomplete or absent records were also removed. Such records generally exclude critical information, like methodological specifics or findings, which are vital for a comprehensive and transparent evaluation. Omitting these publications reduced the likelihood of contradictions and reinforced the validity of the findings. The stringent acceptance and rejection procedure refined the dataset, finally decreasing the initial 146 records to 56 research included in the final evaluation. The use of stringent criteria ensured the review maintained high scientific integrity, confirming that the chosen research were thematically pertinent, peer-reviewed, and methodologically robust. The omission of non-English publications, incomplete data, and less stringent forms such as conference papers bolstered the legitimacy of the review findings, establishing a robust basis for substantive analysis and interpretation.

Prisma Flow Diagram

The data indicates the systematic review procedure, specifying the identification, screening, and inclusion phases that culminated in the selection of 56 studies for the review as shown in Figure 1. Initially, 146 records were found from the databases. Subsequently, one duplicate record was eliminated prior to the screening procedure, resulting in 145 records available for evaluation. During the screening step, 54 records were eliminated, perhaps due to irrelevance, insufficient focus, or failure to meet requirements. Following the screening, 91 reports were identified for retrieval; however, 24 reports were inaccessible, resulting in a total of 67 reports evaluated for eligibility. Eleven papers were eliminated due to non-compliance with the inclusion criteria. Specifically, 10 were conference papers and 1 was a review, which are often removed from systematic reviews owing to their secondary or less rigorous character. The systematic review encompassed 56 studies, constituting the principal, pertinent research associated with the review's aims. This thorough selection method guarantees that only pertinent and high-quality research are included in the final analysis, upholding the rigor and dependability of the evaluation.
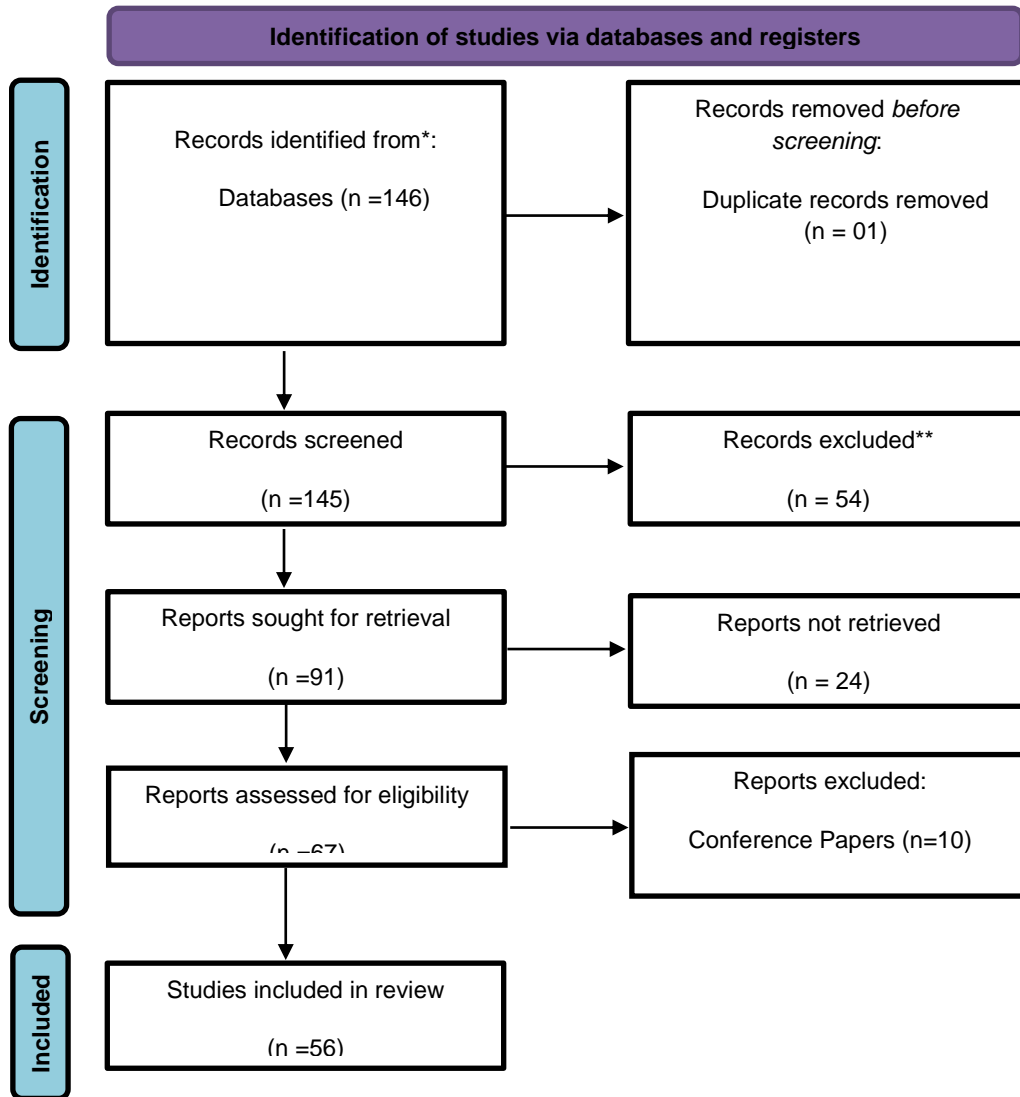
Figure 1: Prisma Flowchart

Results and Discussion

Year-Wise Analysis

Figure 2 displays the yearly publication count of academic publications from 2019 to 2024, indicating a rising trend in research production. The cumulative sum of papers during the six-year duration is 56. In 2019, research activity was negligible, resulting in the publication of only one paper. This was succeeded by a modest rise in 2020, during which two articles were published. The last two years signify the preliminary stage of scholarly interest in the subject, suggesting a time of investigation or restricted emphasis. Beginning in 2021, there was a significant increase in publications, with six articles released each year in both 2021 and 2022. This consistency indicates a continual evolution of interest and contributions in the subject during these years. Nonetheless, the significant increase in scholarly production transpired in 2023, when the quantity of articles escalated to 16. This increase underscores a notable surge in the topic's popularity or significance, maybe influenced by external forces such as global trends, legislative modifications, or

improvements in study. The growing trend persisted in 2024, which had the largest number of publications, with 25 papers. The fact that this is about 44.6% of the total research output for the period of six years exemplifies the highest level of academic activity in accordance with the subject matter. The rapid growth that occurred between the years 2022 and 2024 is evidence that the field has attracted a large amount of interest and may have become a key focus for professionals in the academic world. According to the statistics, there has been a steady growth in the number of academic contributions, with the most significant rises being shown in the two years that have just passed (2023 and 2024). This pattern is indicative of the growing prominence of the matter, which may have been influenced by recent developments or developments in the field that have been made. As a result of the substantial momentum that was built in the years prior, it is possible that future research productivity may continue to increase. The method that is being used here highlights the fluidity of academic interest and exposes the changing aims that are being pursued by the research community.
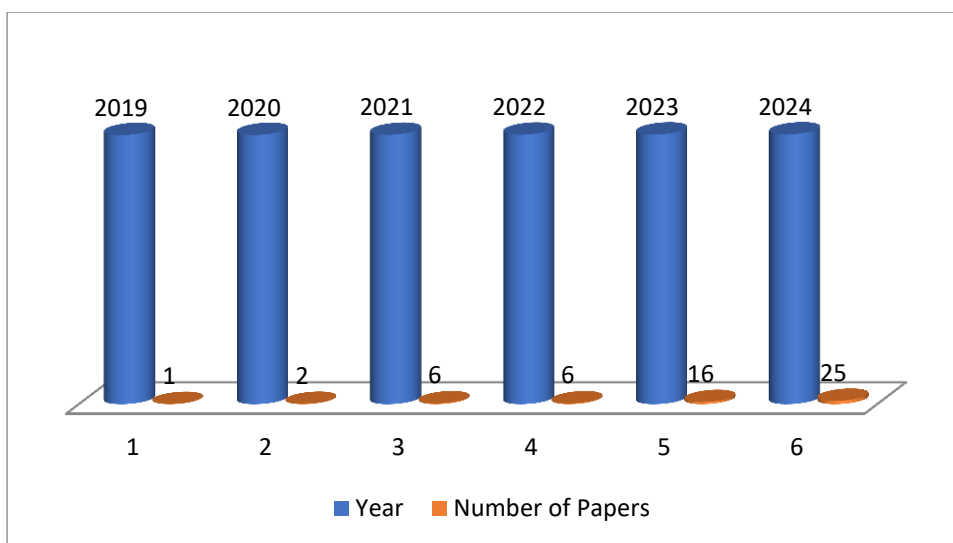

Figure 2: Frequency of papers across years

Document Type

Figure 3 denotes that journal articles and book chapters were the two principal categories of documents that were included in the systematic review, which included a total of 56 pieces. There were a total of 52 publications that were categorized as journal articles, while there were four papers that were classed as book chapters. In this distribution, there is a substantial emphasis placed on journal articles that have been subjected to peer review. These journal articles are often regarded as the most reliable and rigorous source of academic research. There was a significant amount of research that was published in credible academic publications, as evidenced by the fact that the majority of the papers that were included were journal articles (92.86%). These papers are typically subjected to rigorous peer review and are in accordance with demanding methodological requirements, which establishes them as key components of systematic reviews. It is essential to have high-quality, confirmed, and instantly applicable research findings in order to arrive at appropriate conclusions in the areas of Digital Transformation, Commercial Banking, and Retail Banking. Their preeminence in the review highlights the importance of these findings. The integration of these articles ensures that the conclusions and concepts derived from the review are

founded on research that is both substantial and respectable in the academic community. Not only did the evaluation include journal articles, but it also included four book chapters, which accounted for 7.14 percent of the overall study. There are several instances in which book chapters offer substantial theoretical insights and extensive analysis of certain topics. The fact that they are included indicates that an effort is being made to incorporate a variety of views and conceptual frameworks, which are not always investigated in journal articles. These chapters most likely provided additional insights or crucial background information, which contributed to an increase in the overall level of knowledge on the review themes. Nevertheless, the fact that their proportion is lower in comparison to that of articles may indicate that there is less of a focus placed on book-based contributions in the body of literature or that it is more difficult to identify book chapters that are relevant to the particular topics that are being investigated. The priority that the review places on methodological rigor and empirical dependability is highlighted by the fact that journal papers are preferred over other forms of publication. With the help of these, as well as a small number of book chapters, the review was able to achieve a comprehensive yet focused portrayal of the academic literature. In addition to providing a complete platform for future study and conversation in fields such as digital transformation, commercial banking, and retail banking, this distribution ensures that the discoveries are both grounded in theoretical underpinnings and grounded in practical applications. The systematic review is improved in terms of its overall quality, depth, and relevance when it is performed with a combination of different types of documents.
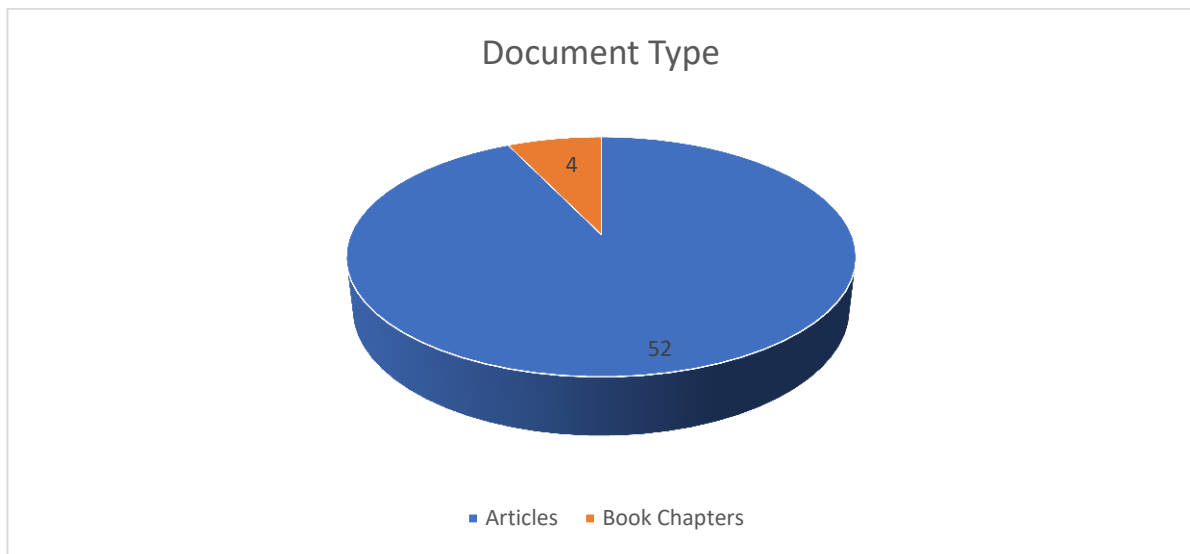

Figure 3: Document types

Source-Wise Analysis

Table 2 represents the source-wise analysis of the systematic review. It was determined that the 17 articles that were incorporated into the study were drawn from five primary journals, with the most significant contribution coming from Sustainability (Switzerland). This journal had eight papers, which accounted for 47.06 percent of the total number of papers. Incorporating sustainability concepts into research on digital transformation, commercial banking, and retail banking is becoming increasingly important, as seen by the significant contribution made by Sustainability (Switzerland). Its preeminence highlights its status as a premier venue for multidisciplinary research that integrates environmental, economic, and social aspects with banking and financial systems. The second-largest contribution was Finance Research Letters, which comprised 3 papers or 17.65% of the total. This magazine emphasizes expedited, high-caliber research, highlighting

the increasing importance of prompt and creative financial studies, especially in domains such as technology change and advancing banking practices. Three journals Cogent Economics and Finance, Banks and Bank Systems, and Systems each contributed two papers, constituting 11.76% of the total for each journal. Cogent Economics and Finance offers an open-access platform for a variety of research in economics and finance, particularly relevant to studies on financial inclusion and banking systems. Banks and Bank Systems focuses on matters concerning financial institutions, rendering it a pertinent resource for study on Commercial Banking and Retail Banking. Simultaneously, Systems emphasizes multidisciplinary research that incorporates systems theory and analysis, effectively connecting with the technological and operational dimensions of digital change within the banking industry. The source-wise analysis indicates a varied yet focused assortment of publications, with Sustainability (Switzerland) prevailing in contributions. This distribution indicates a robust emphasis on sustainability and finance-oriented research, augmented by specialized insights from publications dedicated to economics, finance, and systems analysis. The equilibrium among various sources guarantees a comprehensive representation of viewpoints, methodology, and topic scope within the systematic review. This methodology fortifies the review's conclusions by amalgamating concepts from both general and specialist fields, so augmenting its relevance to current research in banking and digital transformation.

Table 2: Source Wise Analysis

Journal Names	Number of Papers	Percentage
Sustainability (Switzerland)	8	47.06%
Finance Research Letters	3	17.64%
Cogent Economics and Finance	2	11.76%
Banks and Bank Systems	2	11.76%
Systems	2	11.76%
Total	17	100%

Countries Analysis

Figure 4 refers to a visualization of countries as nodes in a network using clustering, weighting and citation analysis to illustrate contribution and impact of countries in a research context. Every country is represented by coordinates (x, y) and belongs to certain of cluster 1, 2 or 3. These include link, document and citation counts, normalized citation count, average publication year and average citation count. Australia is in Cluster 2 where the contributions are fairly divided among all of metrics; however it has moderate citation impact of 4.1667 and average publication year of 2024. Two countries in Cluster one include Greece and Malta, The former has total citations of 35 and total normalized scores of 3.2812 and published mainly around 2022. Such countries are highlighted as important members of Cluster 1 because they demonstrated high citation indicators. India falls in the second cluster of the journal bucket map with minute numbers of citations (1) and normalized value of 0.8333, but active in current year with articles published in 2024. Two countries in Cluster 3 are Japan and Oman and both are barely active. Japanese publications have lower averages of citations (0.0337) and normalized citation (0.424) Nevertheless, these publications are relatively older compared to other top-ranked countries, self-published in 2021.5. This is barely visible in Oman's statistics, which garnered 0 citation, a meagre achievement. For clusters 1 and suffering economies including Viet Nam have recorded inflated figures hence are noteworthy. Most similar to the current quintile, it shows the highest normalized citation weight

(9.063) as well as an enormous number of document contributions that evidence its focus on important work from 2023.125 important research. This indicates that Viet Nam has been featured more lately in latest literature. In general, citation influence is highest in countries of Cluster 1 especially Greece, Malta and the Socialist Republic of Viet Nam. Thus, Cluster 2 is least active with moderate contribution like Australia, while cluster 3 least active with very less contribution. This analysis further highlights the differential involvement of countries in the progress made in research work, with references to citation score and publication freshness.
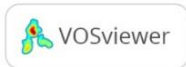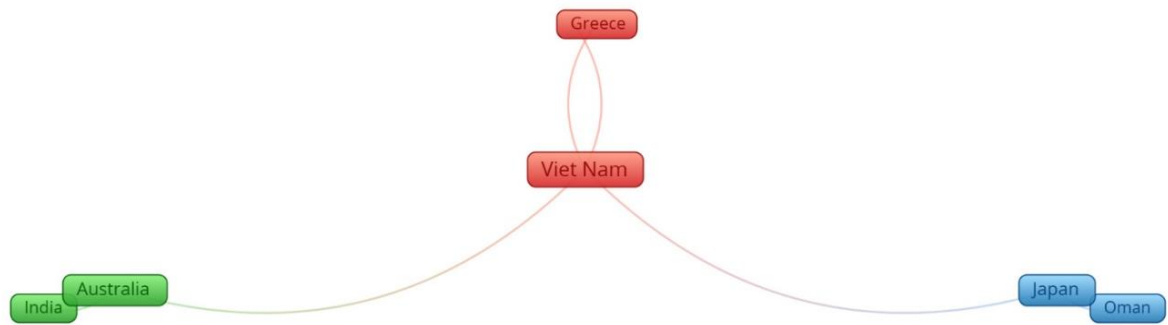

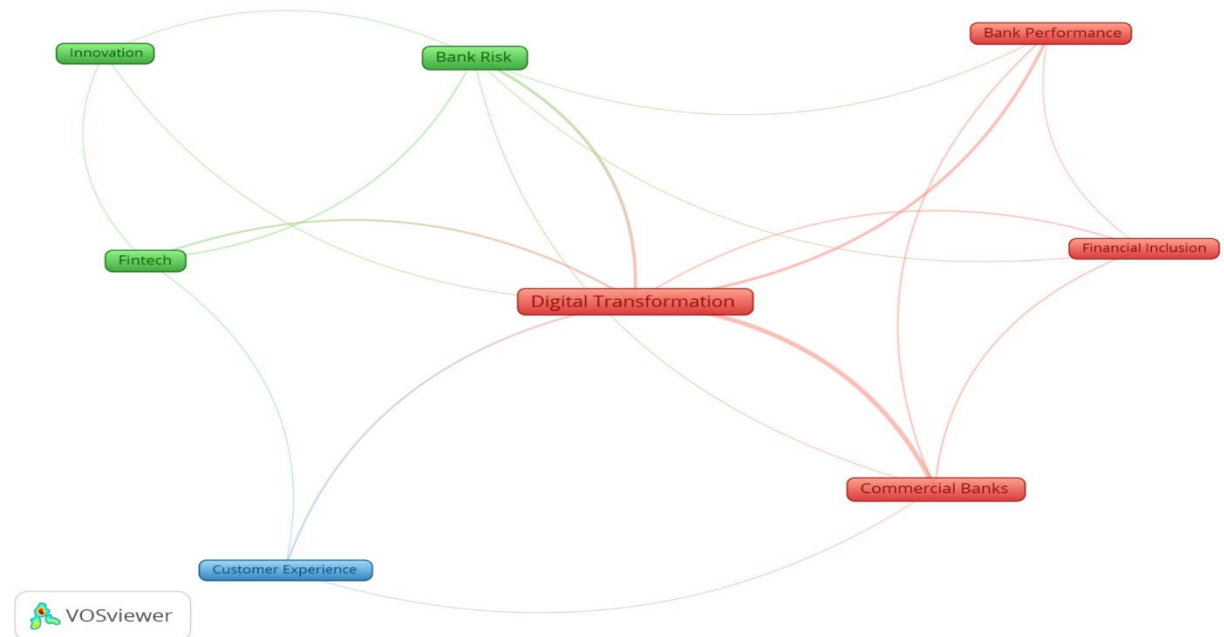**Figure 4: Country-wise analysis**

Keywords Analysis

Figure 5: Keywords analysis

Figure 5 illustrates a network analysis of primary research themes, categorized into clusters according to their connection strength, frequency, and citation metrics. It offers insights into the significance and influence of many subjects in academic study, with clusters emphasizing thematic interrelations. Cluster 1 encompasses significant subjects such as Digital Transformation, Commercial Banks, and Financial Inclusion. Digital Transformation stands out as the predominant subject, with the highest frequency (43) and overall link strength (40). It is often referenced (average 8.3023 citations) and is pivotal in research published in 2022. Likewise, Commercial Banks demonstrates significant involvement with 17 occurrences, a total link strength of 22, and an average normalized citation score of 1.2282, indicating its relevance in research. In the year 2023, the publication Financial Inclusion has a remarkable normalized citation score of 4.3571, which reflects the expanding significance of research on inclusion.5. The significance of these subjects in contemporary academic discourse is highlighted by the fact that they have a major influence inside Cluster 1. Subjects such as Bank Risk, Fintech, and Innovation are included in Cluster 2 of the curriculum. Bank Risk holds a noteworthy position, as evidenced by the fact that it has a considerable frequency of occurrences (9) and a normalized citation score of 1.9048, which indicates that it is relevant in modern research (2023.7778). With only six occurrences and five thousand three hundred thirty-three citations, the field of fintech has a lower normalized score of 0.6749, which indicates that it is a relatively new area of study being conducted. Likewise, Innovation has fewer occurrences (2) and normalized citations (0.7999), suggesting a specialized or developing interest within this cluster. Cluster 3 is only characterized by Customer Experience, which has a restricted frequency of occurrences (3) and link strength of 5. Notwithstanding its limited scope, it attains a commendable normalized citation score of 1.1667, indicating a reasonable degree of scholarly attention. Digital Transformation and Financial Inclusion are the foremost influential factors, but Bank Risk and Bank Performance continue to be essential subjects. Emerging topics such as Fintech and Innovation indicate sectors with development potential. This analysis highlights the differing levels of participation and influence across established and emerging research subjects.

Conclusion& Limitations

In summary, this systematic review has performed an extensive analysis of the domain of digitalization within retail banking, illuminating its progression, trends, and significant themes. The results enhance a sophisticated comprehension of the global scholarly environment in commercial banking by scrutinizing a varied array of academic publications. This investigation clarifies that digital transformation is fundamentally reshaping the commercial banking landscape by fostering operational efficiency, enhancing customer experiences, and catalyzing innovation. Technologies such as artificial intelligence, blockchain, and data analytics are pivotal in enabling personalized services, improving risk management structures, and refining operational processes. However, challenges remain, including integration complexities, cybersecurity threats, and the swift pace of regulatory changes.

However, this extensive evaluation is accompanied by certain limitations. Firstly, the dependence on data exclusively derived from the Scopus database constrains the comprehensiveness of the coverage of all publications pertinent to the subject of digital transformation in commercial banking. Moreover, the examination was aimed specifically at English language sources, leaving out conference proceedings, editorials, and reviews. This exclusion may overlook significant contributions in alternative formats and languages, which merit consideration in subsequent investigations. Despite these constraints, this systematic review provides a substantial basis for

forthcoming research initiatives in the dynamic and rapidly evolving arena of digital transformation in commercial banking.

Future Research Avenues

This research provides a robust foundation for subsequent investigations and initiatives aimed at enhancing the comprehension and advancement of digitalization adoption within the banking sector, which constitutes an essential element of the global financial ecosystem. Hence, ongoing academic studies should consider the prolonged consequences of digital transformation regarding the financial performance of banking establishments and consumer trust. Also, a complete investigation into the incorporation of progressive technologies, particularly quantum computing and decentralized finance, is regarded as important. Moreover, subsequent studies could also examine the socio-economic impacts of digital banking on underrepresented communities, with a specific focus on financial inclusion and equitable access. To effectively address these challenges and propel the discipline forward, interdisciplinary and cross-regional collaboration in research is critically important.

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