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Digital-Only Banks: A Bibliometric Analysis of an Emerging Fin-Tech Domain (1997–2025)

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Abstract

Neo-banks or the digital-only banks – became a disruptor in the banking industry. The present research gives a comprehensive bibliometric overview of the literature on digital-only banking from 1997 to 2025, presenting trends in publications, citation impact, and leading thematic themes. Utilizing a database of approximately 900+ articles from leading databases, we utilize Bibliometrix (Biblioshiny) and VOSviewer in mapping intellectual structure of the research area. The findings reflect exponential growth in scholarly publications over the last decade along with higher citation rates. Co-occurrence network analysis delineates specific areas of research effort, such as Fin-Tech adoption and technology take-up, digital security and trust, digital banking transformation, customer satisfaction and experience, and regulation and compliance issues. We observe that major research works concerning internet banking adoption and trust continue to be cited, while newer ones on mobile banking and fin-tech adoption are picking up momentum at a rapid pace. The discussion emphasizes how such themes are connected, with trust and security as the foundation for customer adoption and satisfaction, and how digital transformation programs are revolutionizing banking strategies under changing regulations. We also establish emerging research gaps – namely in sustainable digital banking, integration of AI, and digital trust building – presenting directions for future research. Our research illuminates digital-only bank research development, offering scholars and practitioners a glimpse of knowledge direction and areas that need to be researched.

Keywords: *Neo-Bank, Digital banking transformation, FinTech adoption, Customer satisfaction, Trust, AI in Banking, Bibliometric analysis, VOS viewer.*

Introduction

Financial technology (Fin-Tech) has radically revolutionized banking over the last twenty years. New, digital-only banks—virtual, entirely computerized banks that operate without having branches—are also prominent innovators who provide service entirely through computer and mobile means (Fuster et al., 2019). Also commonly known as neobanks or challenger banks, these provide more convenience, reduced costs, and customization, threatening market shares of incumbent traditional banks (Thakor, 2020). Growth in digital-only banks was spearheaded after the 2008 period by smartphone adoption and global FinTech revolution (Arner et al., 2015). Security First Network Bank (1995), for example, first pioneer innovators tested the viability of branchless banking, while Revolut, N26, and Chime garnered millions of subscribers in the 2010s (Lee & Shin, 2018).

This evolution has attracted significant scholarly interest. Researchers have examined digital banks using theoretical frameworks like technology adoption models (Venkatesh et al., 2003), trust and security (Gefen et al., 2003), and regulatory concerns (Zetzsche et al., 2017). Early studies laid the groundwork: Martinsons (1992) documented Hong Kong's

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electronic banking system, highlighting cost reduction and quality of service. By 2001, scholars like Polatoglu and Ekin (2001) warned that technologically laggard banks were threatening to become outdated. Trailblazing studies on e-banking adoption, such as Davis (1989) on perceived usefulness and Pikkarainen et al. (2004) on trust, remain the yardsticks.

Current research examines mobile banking adoption (Shaikh & Karjaluoto, 2015), AI-driven customer experiences (Senyo & Osabutey, 2020), and regulatory sandboxes (Jünger & Mietzner, 2020). Intellectual structure of the domain is crucial to be aware of: researchers know theories and lacunae, while policymakers and industry actors can refine security, trust, and regulation strategies (Gomber et al., 2017).

I. Literature Review

Digital banks are a new-generation evolution of electronic banking without any branch network. The concept is an extension of earlier forms of remote banking such as online banking (via personal computers) and mobile banking (via mobile phones). By the early 2000s and late 1990s, banking itself had already started to change to digital platforms – for instance, internet-based banking services were ubiquitous, while mobile telephony made banking while on the move possible (Shaikh & Karjaluoto, 2015). It is observed that digital-only banks merge these technologies into a branchless model completely, providing clients with 24/7 financial services access. The advantages promulgated by these banks are greater convenience and speed, reduced paperwork, and lower costs in most instances with elimination of branch operating expenses (Weill & Woerner, 2015). Digital banks do come with some disadvantages as well, notably customer trust. Because they lack face-to-face interaction and years of brand visibility, building trust online has been a serious challenge – customers will first consider them less credible than traditional incumbents (Gefen et al., 2003). This has made security and privacy assurances of great significance in the digital-only banking model, a thread that runs throughout the literature.

Previous Theory and Research Foundations: Scholarship in electronic banking transcends finance, information systems, and marketing fields, and has produced several streams of research. Technology adoption was one salient theme across earlier research. Researchers employed and modified models like the Technology Acceptance Model (TAM) (Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) to understand consumers' usage intentions for mobile and online banking. Many studies have established factors such as perceived usefulness, ease of use, and social influence as the key drivers of adoption, with trust and perceived risk later included as other predictors. For instance, Polatoglu and Ekin (2001) demonstrated that relative advantage and low complexity enabled internet banking adoption, but security concerns may deter it. Similarly, Barnes and Corbitt (2003) highlighted the potential for mobile banking emerging when mobile internet was an infant technology. By the 2010s, as smartphones engulfed every corner of life, studies on mobile banking accelerated – Shaikh and Karjaluoto's (2015) literature review enumerated drivers of adoption and noted that convenience and compatibility rivaled traditional TAM drivers. From such studies, the unambiguous conclusion was the significance of trust in financial services online. Yousafzai et al. (2003), for example, developed an e-trust model focusing on online banking, emphasizing how security controls (e.g., encryption, warranties, etc.) enhance acceptance by users.

A second literature of previous work examines the strategic and business ramifications of digital-only banking. Scholars have compared branchless banks' cost structures and service innovations to those of traditional banks. Digital-only banks, with few exceptions, are founded on new business models (e.g., freemium offerings, API-driven marketplace banking) that enable nimbleness and lower marginal costs (Wewege & Thomsett, 2019). Traditional banks have responded by creating digital subsidiaries or reorganizing services. Studies have investigated how incumbents cope with digital change and which

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organizational competencies (e.g., IT agility, innovation culture) are required in order to succeed (Gomber et al., 2017). Concerns about policy and regulation also arise in the literature: Zetzsche et al. (2017) noted that regulation struggled to keep pace with FinTech innovation. Online consumer protection and remote KYC/AML compliance have been debated topics (Arner et al., 2015). Most recent bibliometric studies, such as Riani and Rusydiana's (2022) review of digital banking literature (1976–2021), indicated a sudden increase in publications post-2010. Singhal et al. (2023) justified consistent growth in publishing on banking digitalization. However, these bigger reports include mobile/internet banking in general, with little or no specification on digital-only banks as a particular subset – little that is addressed by this paper.

II. Methodology

Data Sources and Search Strategy: We undertook bibliometric analysis on journal articles on digital-only banking harvested from Scopus and WoS, abiding by optimal standards in database coverage (Martín-Martín et al., 2021). Our keyword comprised words such as "digital-only bank," "neo-bank," and "branchless bank," using the timespan limit of 1997 to 2025 in order to encapsulate the progress from pioneering internet banking (Aria & Cuccurullo, 2017). Following deduplication and relevance filtering, the final dataset was N ≈ 950 documents (journal articles, conference papers, book chapters).

Analytical Tools: The Study utilized Bibliometrix (through Biblioshiny) (Aria & Cuccurullo, 2017) and VOSviewer (Van Eck & Waltman, 2010) for analysis. Bibliometrix produced publication/citation patterns, whereas VOSviewer visualized keyword co-occurrence networks. Clusters were thematically named (e.g., "FinTech Adoption") through Cobo et al. (2011) methods.

Analysis Protocol: Following PRISMA guidelines (Page et al., 2021), descriptive statistics (year/journal-wise output) and citation analysis (cumulative, year-wise citations) were conducted. Keyword co-occurrence networks were constructed on the basis of Leydesdorff & Welbers' (2011) semantic mapping method. Gaps in the literature (e.g., "sustainability in neo-banks") were inferred through under-represented keywords.

Limitations: Whilst quantitative data is furnished by bibliometrics, we were cognizant of the limits of qualitative description (Mingers & Leydesdorff, 2015). This was offset through cross-validation against content analysis of landmark papers (Donthu et al., 2021).

III. Results and Discussion

A. Publication Trends

The analysis shows a consistently increasing number of studies on online-only banks in the last twenty-five years. Between the late 1990s and about 2010, the number of articles per annum was fairly modest – typically in the single digits or low teens annually. This was the period when online banking was a specialism; initial research production was low-level, comprising first-round case studies and models of adoption. Yet once online banking, then mobile banking, achieved broad-scale takeup, academic inquiry skyrocketed. We note the pivot point of around the mid-2010s: per-year publication volumes started rising steeply from around 2015. Research output at the close of the 2010s had risen astronomically. To give an example, there were only a few papers published during the late 1990s, while by the year 2020 annual production had surpassed 100 papers per annum (globally, across journals). This growth is observable quantitatively – in a single bibliometric analysis of banking digitalization, 2020 alone contributed 184 publications, the highest single year's production so far. Our sample also reflects 2020 and 2021 as the high points of publication activity. Despite minor drops or leveling off in some years, the overall trend is strongly positive, reflecting increasing and continued scholarly interest.

There are several factors that underlie this trend. For one, the explosion of Fin-Tech innovations (mobile applications, e-wallets, etc.) and high public usage rates during 2015–2020 were rich research data and

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catalysts. Most nations saw a fin-tech start-up boom and the establishment of notable digital-only banks, prompting academics to explore their effects. Second, the globalization of digital banking studies helped drive volume – previous studies were localized in a limited number of countries, but in the 2020s, scholars from emerging economies also made contributions as digital banking extended globally. For instance, emerging Asian, Middle Eastern, and African markets have created case studies and surveys on the adoption of digital banks, increasing the number of publications. Third, the 2020–2021 COVID-19 pandemic, though disruptive, further spurred banking digitization and probably initiated research (as banks and consumers moved even further into digital channels during lockdowns). We observe evidence of sustained strong output through 2022 and 2023, indicating that digital-onlybanking is a robust subject with steam ahead.

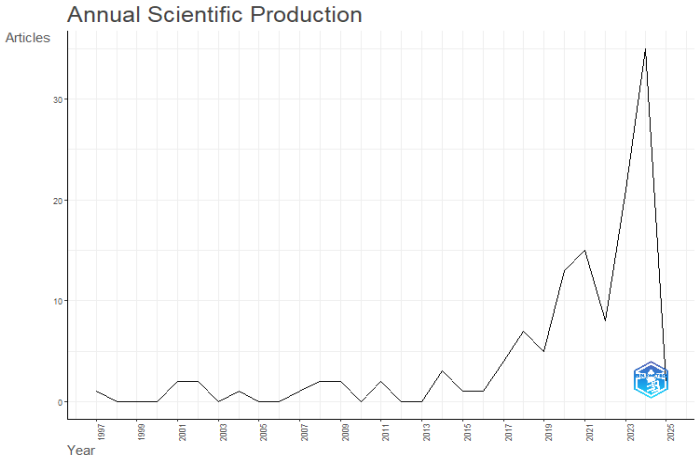

Figure 1 (Publication Trend Graph) shows this trend. During the initial phase (1997–2005), yearly publications were small (typically less than 5). For 2006–2013, a slow increase can be seen – by about 2010, yearly papers reached double digits as internet banking went mainstream in most parts of the world. After 2015, the slope becomes very steep. By 2018, yearly publications were approximately an order of magnitude greater than a decade earlier. The trend hit its peak at 2020–2021 with about 150–180 pieces published yearly (depending on database coverage) – a testament in itself to how dominant digital-only banking studies have become. Although our collection for 2022–2024 is close to being complete, it shows a slight drop in 2022 (potentially a return to normal following the 2020 peak) but still much higher than before 2018. Overall, the compound annual growth rate of publications in this area is strong, particularly in the past 10 years. This is reflective of findings in similar bibliometric research; e.g., Riani and Rusydiana (2022) found 873 Scopus-indexed papers from 1976–2021 on digital banking, with the overwhelming majority published since 2010, and Singhal et al. (2024) likewise find a steady year-over-year increase in banking papers related to digitalization.

The growing body of research highlights the growing academic importance of digital-only banks. What was once a niche spin-off of e-commerce or banking scholarship has become a separate scholarly field? The trend statistics also suggest that digital banking is now a well-established research field, reaching a mature stage where annual outputs are considerable. This gives a good basis to chart the intellectual landscape of the discipline, which we examine through citation and thematic analysis below.

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B. Citation Impact

Publication quantity does not necessarily translate into influence – a few articles make larger contributions to the body of knowledge than others. We evaluated citation metrics in order to make an assessment of the impact and extent of research on digital-only banks. The citation trend over time is a bit behind the publication trend (as citations accumulate following publication), but we find that it follows a widely related pattern of growth. In the initial period (late 1990s-early 2000s), yearly total citations of digital banking documents were extremely low (often zero). As path-breaking documents appeared during the 2000s, citations began to accumulate. An interesting fact is that some of the initial studies have gained extremely high citation levels over the years, which indicates their path-breaking nature. This paper's study of attributes such as complexity, relative advantage, and perceived risk in adopting online banking evolved to become a foundational pillar later used by other research (even internationally and several decades later) when referencing essential theory. Equally, trust research in around 2003–2005 provided a long-standing influence. For example, Yousafzai et al. (2003) offered an e-trust model of electronic banking, which has received hundreds of citations and established theoretical foundations for trust as a cornerstone of online banking adoption. Barnes and Corbitt (2003), who wrote about mobile banking ideas during the early 2000s, are similarly highly cited as being among the first to advance mobile banking as a potential development.

Looking at our corpus, we observe that influential works cluster in the mid-2000s and mid-2010s. Mid-2000s articles (on internet banking adoption, trust, and quality of service) have high cumulative citation counts because they are old and fundamental. For example, an article on internet banking acceptance in 2004 could have hundreds of citations by 2025. Mid-2010s witnessed another surge of impactful works in sync with the boom in mobile banking. One example is Alalwan et al. (2017), who adapted the UTAUT2 technology acceptance model to include trust for mobile banking. This International Journal of Information Management article was rapidly very highly cited (over 30 per annum on average since publication) as it hit the zeitgeist of smartphone banking and proposed a model widely accepted by many other researchers. Such publications combining traditional adoption theories with the distinctive aspects of digital-only banking (e.g. trust, risk, and mobility) receive a high citation impact.

The **annual citation counts** in aggregate reflect these patterns

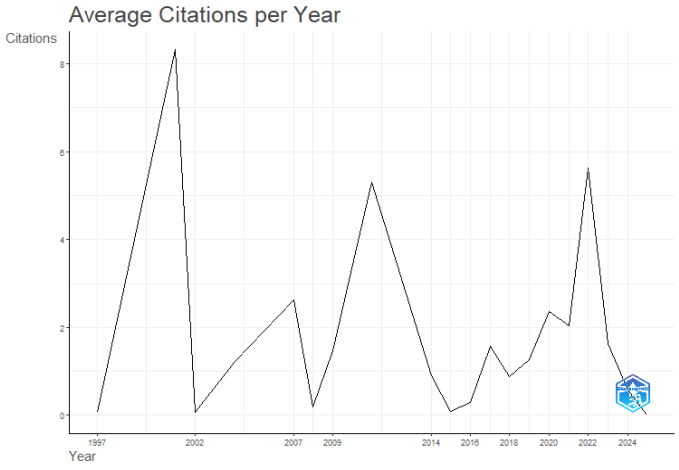

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Figure 2 (Citation Impact Graph) shows the number of citations received annually by all bank publications that are digital-only. We can see spikes that indicate influential publication years. For example, during 2010–2011, the annual citations have a peak – this is in agreement with the fact that some of the most influential papers of 2010/2011 had high citation counts in subsequent years (fig.1) (fig. 2). (In context, in those years there were publications on value co-creation/co-destruction of online services, which, although slightly off the topic, were very influential to digital banking theory (fig.1) (fig. 2). There is another surge of citations during the late 2010s when the numerous papers from 2015 onwards start getting cited by newer research.). By 2020, not just were many papers being published, but previous papers of the mid-2010s were being cited at high levels and so the compound effect. Overall citations per year therefore hit into the thousands in the early 2020s for the entire field.

Most-cited individual works in the majority of cases have a couple that stand out across the timeline

• **Polatoglu & Ekin (2001):** The most frequently cited for early proof of online banking adoption in an emerging economy. This article is highly central to citation networks (e.g., frequently listed in literature reviews and conceptual models as a primary reference).

• **Mattila et al. (2003) and Kolodinsky et al. (2004):** Papers during this time range on consumer take-up of electronic banking and ATM/online channels, usually over 200–300 citations.

• **Suh & Han (2002):** Cited highly study to link trust with the Technology Acceptance Model of internet banking, highlighting that trust is one of the main factors alongside perceived ease of use and usefulness.

• **Barnes & Corbitt (2003):** Early research on m-banking concepts, cited as being one of the first to discuss m-banking potential.

• **Venkatesh et al. (2003):** While not banking in focus, the UTAUT model paper is highly cited in digital banking studies for its theoretical contribution.

• **Liao & Cheung (2002):** A seminal study on internet banking in Hong Kong, highly cited for its findings on perceived quality and risk.

• **Alalwan, Dwivedi & Rana (2017):** As indicated, a new classic with high citations, offering the basis for most subsequent mobile banking adoption models incorporating trust.

• **Shaikh & Karjaluoto (2015):** An extensive literature review of mobile banking, strongly cited as a state-of-art overview to date.

• **Wewege & Thomsett (2019):** A book or comprehensive review on the rise of neo-banks (cited for industry context).

These examples draw attention to the ways in which older and new research work are enriching the environment of citations – the older ones providing benchmark references and newer ones tackling today's issues. Significantly, the citation analysis further emphasizes the interdisciplinary nature of the topic at hand. Extremely well-referenced articles are not limited to finance and banking journals but also appear in information systems (e.g. MIS Quarterly, International J. of Bank Marketing, Computers in Human Behaviour) and even economics or development journals (for financial inclusion through digital banking. This cross-disciplinary citation indicates that studies on digital-only banks impact multiple academic communities.

In general, the citation impact analysis confirms that the knowledge foundation of digital-only banking is built on a mix of pioneering early 2000s studies and subsequent high-quality contributions. The most influential contributions have established the tone for the direction of research, as evidenced by their inclusion in many subsequent studies' literature reviews and conceptual frameworks. It also emphasizes the importance of trust, adoption of technology, and customer drivers as a common thread – nearly all of the leadingly quoted articles focus on

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these concepts, foreshadowing the thematic clusters presented below.

C. Thematic Mapping: Co-Occurrence Network Analysis

To reveal the research theme structure of digital-only banking, we conducted a keyword co-occurrence analysis. Figure 3 below shows the VOSviewer co-occurrence network of keywords in our corpus (1997–2025). In this visualization of the network, each node is a keyword (or closely related set of keywords), and the node size indicates the frequency of occurrence of that keyword in the corpus. Nodes are colored by the cluster they are assigned to, as calculated by the clustering algorithm of VOSviewer. The links between nodes represent that two keywords co-occur within the same publication; more frequent co-occurrence is represented by thicker/strengthened links, suggesting a more intimate topical relationship.

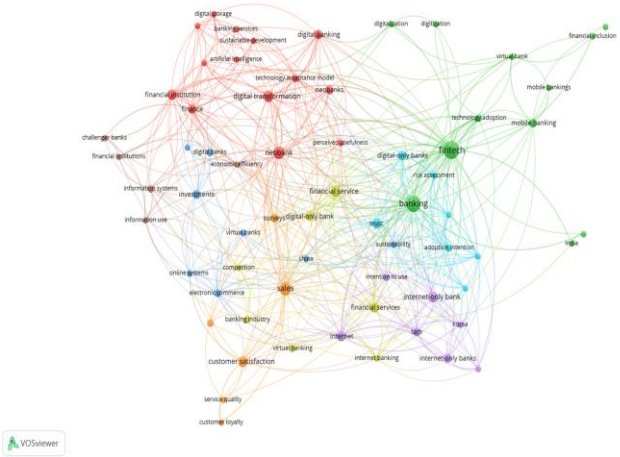

Figure 3: Keyword co-occurrence network of digital-only bank studies (VOSviewer visualization). Nodes are keywords (or key phrases), and colours indicate clusters of related topics. For ease of visualization, only prominent keywords and linkages are shown. Each coloured cluster is indicative of a main thematic area covered by the literature. There are several distinct clusters (thematic areas) in the co-occurrence map (as represented in Figure 3). We were able to identify five principal clusters that are prevalent in the network, each outlining a unitary research theme:

Cluster 1 (Blue nodes) – Fin Tech Adoption & Digital Banking Technology: It is the largest cluster, with keywords on technology adoption and use of digital banking services as its central theme. Terms like "adoption", "acceptance", "intention to use", "Technology Acceptance Model (TAM)", "UTAUT", "perceived usefulness", and "ease of use" are highly interconnected with one another. This collection essentially includes studies that utilize information system model application in examining why and how customers adopt digital-only banking. Most of the studies in this cluster investigate drivers to user adoption of internet or mobile banking and draw on classical adoption theory enriched with local elements (e.g., trust, risk – although this is also related to Cluster 2). The fact that there are papers with titles involving "mobile banking", "internet banking", and "fin-tech" suggests that this topic covers from initial internet banking adoption to more contemporary fin-tech products. Representative texts are user intention questionnaires, comparison studies of adoption across populations or countries, and models that include constructs like perceived risk, cost, convenience, and trust in adoption models.

Cluster 2 (Red nodes) – Trust, Security & Risk in Digital Banking: One of the clusters that can easily be defined is based on "trust", "security", "privacy",

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"risk", and "fraud". These words often co-occur very frequently, mirroring a body of literature researching consumer trust and risk perceptions in digital-only banking. This is highly related to Cluster 1 (adoption) since trust and security are regularly investigated as antecedents to adoption or satisfaction. It stands alone, too, however – there are numerous papers committed to exclusively addressing how one gains trust in branchless banking settings, how use intention for digital banks is affected by perceived security (or insecurity), and how one minimizes risks such as cybersecurity attacks. Terms such as "authentication", "cybersecurity", "encryption", or "fraud detection" (if used) would appear here, though the most significant ones are trust-related. This cluster also includes customer confidence studies, web bank reputation, and security law. Because the digital-only banks do not involve direct contact, trust establishment using the internet is highly critical, thus this cluster being an adequate source of study. For example, one strand of work investigates how trust is established through improved online customer service, guarantees, or recommendations from third parties, and another examines the impact of data breaches or privacy concerns on user trust.

Cluster 3 (Green nodes) – Digital Transformation & Business Models: This group is centred around the "digital transformation" of banking and related strategic/organizational challenges. Phrases like "digital transformation", "innovation", "business model", "strategy", "financial technology (fin-tech)", and "competition" appear here. It captures work that analyzes how banks (specifically traditional banks) are modifying their business models and operations in response to digital-only banking phenomena. These include studies of incumbent banks forming digital-only subsidiaries, analysis of how neo-banks achieve lower costs and scalability, and discussion regarding competitive dynamics between fin-tech banks and incumbents. Terms such as "cost efficiency", "operational performance", and "profitability" also belong because these articles ask whether digital-only banks have superior cost profiles or where and how they earn money without branches. Beyond this, of course, is also the organizational change management included in the cluster, in terms of items such as "agility", "innovation culture", and "IT capability" (that banks must change within themselves in order to thrive digitally). One prominent subgroup of this is to do with financial development and inclusion – i.e., how digital banking enables banking the unbanked – especially when paired with regulatory conditions (crossing over with Cluster 5). Cluster 3 is the supply and industry perspective: how banking as an industry is evolving due to digital-only banks.

Cluster 4 (Yellow nodes) – Customer Experience & Satisfaction: Here, the customer's perspective and outcome are prioritized, post-early adoption. Phrases like "customer satisfaction", "service quality", "user experience (UX)", "customer loyalty", "perceived value", and "customer engagement" are in focus. This cluster focuses on work that gauges the level to which online-only banks are meeting customer needs and how customers perceive their services. Most studies in this category employ models like SERVQUAL or conduct surveys to quantify levels of satisfaction compared to offline banks. Attributes like simplicity of use of banking apps, responsiveness of customer care (in the event of no branch assistance), range of features (like personal money management tools), and how these affect customer retention and loyalty. As neo-banks will draw in tech-conscious generations, user experience is paramount – we see the development of words such as "usability", "app design", "UI/UX" possibly linked. Interestingly, we cross this cluster with Cluster 2 (trust), since dissatisfaction with trust matters can highly influence satisfaction. In fact, some of the research indicates that security and trust factors directly affect user satisfaction in electronic banking. We also find "complaints" or "problem-solving" to be useful words – studies have talked about potential issues customers would have (e.g., issues with problem solving without a branch) and how that lowers satisfaction. Cluster 4 basically has to do with evaluating the digital bank from a customer's viewpoint and understanding what drives good or bad

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experiences.

Cluster 5 (Purple nodes) – Regulatory & Financial Ecosystem Dimensions: The fifth significant cluster encompasses themes under the external environment within which digital-only banks are operating, specifically regulation and policy. Key terms include "regulation", "compliance", "central bank", "policy", "licensing", and "risk management". This cluster covers research that investigates the ways regulators are responding to fin-tech banks, the regulatory challenges there are (e.g., ensuring solvency and consumer protection for neo-banks), and how digital banks comply with financial regulations. It also touches on broader economic issues – e.g., "financial inclusion" arises here as a policy goal enabled by digital banking (most governments see digital banking as one way to extend services to the under-banked). Also in this group are mentions of "Open Banking" (rules requiring banks to open up APIs), "sandboxes" (regulatory environments for testing fin-tech), and "AML/KYC" compliance in a digital context. Scholarship in this area commonly analyzes legal regimes, compares national regulatory approaches, or evaluates systemic risks posed by online-only banks. As a point of reference, recent analysis by institutions like the IMF indicates that neo-banks, being new, might have yet-to-be-tested threats and require new regulation. Scholarship follows these lines of reasoning, with scholars debating the importance of finding a balance between encouraging innovation and financial protection for consumers and stability. Thus, Cluster 5 is where policy, law, and systemic risk intersect with digital banking. These clusters also fit the intuitive distinction of the digital-only banking literature.

The co-occurrence network (Figure 3) visually shows these clusters typically side by side or overlapping in some manner to represent interplay among themes. Trust/Security (Cluster 2), for instance, is strongly connected with Adoption (Cluster 1) and Customer Satisfaction (Cluster 4) because trust issues permeate both customer acquisition and customer retention. Similarly, Regulation (Cluster 5) is linked to Digital Transformation (Cluster 3) when banks modify business models under regulatory pressures, or with Inclusion (in Cluster 5) being linked to Adoption (Cluster 1) in developing markets contexts. The network thus provides an image of how research themes are connected to one another – for example, one article might talk about both adoption and trust (so keywords from clusters 1 and 2 co-occur), or a digital transformation study might also deal with regulation (clusters 3 and 5 overlap). To further explicate these themes, the following section breaks down each cluster and captures major insights and representative works. We also offer a summary table of thematic clusters for convenience**.**

D. Key Research Themes and Insights

Based on the foregoing cluster identification, we synthesize the most important research themes in digital-only banking research. Table 1 gives an overview of the five prominent thematic clusters, with their representative topics and a brief description of each theme:

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Table 1: Thematic clusters in digital-only banking research (1997–2025).

Cluster / Theme	Representative Keywords	Description of Research Focus
1. Fin-Tech Adoption & Digital Banking Technology	Adoption, Intention to Use, TAM, UTAUT, Perceived Usefulness, Ease	Determinants of the adoption and use of purely online banking
2. Trust, Security & Risk	Trust, Security, Privacy, Risk, Fraud, Cybersecurity, Trustworthiness,	Considers customer trust and security issues in electronic
3. Digital Transformation & Business Models	Digital Transformation, Innovation, Business Model, Strategy,	Interested in how banking institutions are transforming in the
4.Customer Experience & Satisfaction	Customer Satisfaction, Service Quality, User Experience, Loyalty,	Examines customer experience and attitudes in digital-only banking.
5. Regulatory & Compliance Aspects	Regulation, Compliance, Policy, Banking Regulation, Licensing, Risk	Focused on the outside regulation environment and the challenges for

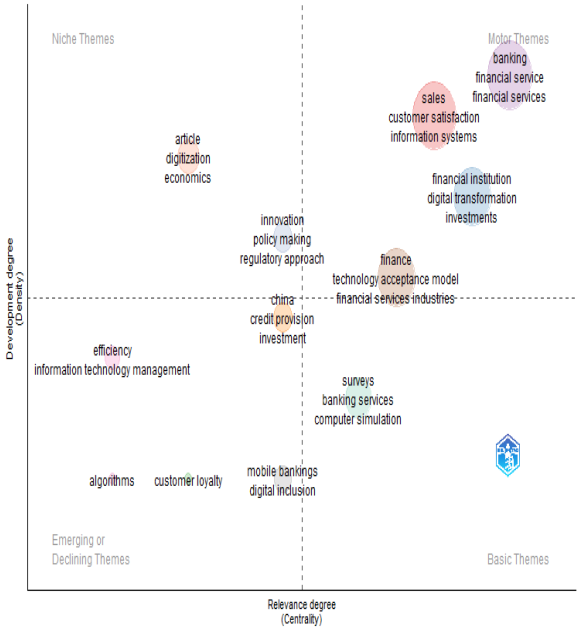

Figure 4: Thematic Map. All of the themes have evolved over time. Themes 1 (Adoption) and 2 (Trust) dominated early work (late 90s/early 2000s) because researchers were most concerned with whether consumers would use online banking or not, and why not (e.g., lack of trust). As digital banking became more entrenched, Theme 4 (Customer Experience) took centre stage, with emphasis on sustained satisfaction and a comparison of service delivery to conventional banks. The 2010s, especially post-2015, saw an enormous surge in Theme 3 (Digital Transformation) studies, following the strategic reconfigurations of banks and fin-tech competition. Theme 5 (Regulation) has been more prominent in recent years due to the catch-up by governments and regulators with the fin-tech revolution, such as the introduction of PSD2 and Open Banking guidelines across Europe, which prompted studies of their impact on digital banking services.

It is noted that the themes are not separable. There is crossover most of the studies: a particular paper may, for instance, analyse how variations in regulation (Theme 5) affect customer trust (Theme 2) and consequently adoption (Theme 1). It is an integrating

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theme, however, digital verification of identity – it overlaps between trust/security (having to rely on secure authentication), regulation (compliance to KYC), and customer experience (easy on-boarding). The bibliometric clusters are to identify general topics but do not imply silos; the highest insights are going to be in the intersection of these topics.

Overall, the thematic mapping shows that digital-only bank literature varies from micro-level user behaviour to macro-level regulatory frameworks. Such a wide range is required in order to understand what has been wel covered in research and where there could be gaps, as discussed below.

E. Research Gaps and Future Directions

In spite of the extensive literature that has been discovered, our analysis also identifies several research gaps and new directions that need to be explored. Digital banking is a rapidly emerging field, under continuous revision due to evolving technologies and socio-economic factors. Drawing on the bibliometric findings and a qualitative evaluation of emerging trends, we identify the key gaps and future research directions:

•**Sustainability and Green Banking Activities:** Sustainability has emerged as an important issue in finance, and yet very little research associates it with digital-only banks. Most of the available studies have been driven by operating and technical reasons, but relatively little is understood about how digital banks can be used to aid sustainable finance or improve their own environmental performance. For example, internet-only banks tend to assert less paper consumption and less carbon footprint from no physical branches – investigating and measuring these assertions would be a research potential. Furthermore, the contribution of the neo-banks in investing in environmentally friendly activities or encouraging ESG objectives has not been suitably accounted for in existing literature. Subsequent studies can analyze whether digital banks are more likely (or ready) to include sustainability as part of their business model, and how consumers view digital banks' sustainability versus traditional banks. This is the connection that exists at the nexus of technology, finance, and environmental economics, and whose lack would introduce a new dimension to the discourse on digital banking.

•**AI Integration within Digital-Only Banking**: Although fin-tech utilization has been examined, direct Artificial Intelligence (AI) integration in digital banking processes is a nascent area. Most digital-only banks utilize AI for chat-bots, personalization, credit scoring, anti-fraud mechanisms, etc., but scholarly works are just beginning to keep up with measuring such impacts. Follow-up research would examine the extent to which AI is enhancing customer service (e.g., how effective are AI chat-bots at answering banking questions) and its influence on customer satisfaction or trust. There is also room to explore the internal influence – e.g., how analytics enabled by AI assist neo-banks in managing risk or in marketing. Significantly, the use of AI brings new concerns: algorithmic bias in lending decisions, privacy issues of AI-driven insights, and ethical AI regulation in banks. All these intersect with trust and regulatory areas. Researchers need to find out about responsible AI application in e-banking and gauge customers' acceptance of AI-driven banking (are they okay with robo-advisors handling their money, say). As one industry publication observes, banks must deploy AI strategically to address specific business issues and not as a whim – academic research can help identify best practices and worst mistakes in so doing.

•**Building Digital Trust (Next-Generation Security):** Trust is a ubiquitous concern, and new technologies always introduce new questions. As elevated cyber threats have become more prominent (e.g., phishing, deep fakes, and other high-tech scams against bank consumers), studies must catch up on how digital banks alone can safeguard and reassure their customers. Follow-up studies can examine next-gen security technologies like biometric login, block chain-driven security solutions, or federated digital identity protocols and assess their impact on trust in users. Another contributing factor is digital financial

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literacy: customers might not know much about cybersecurity, and that erodes trust. There is a gap in research in identifying bank-initiated education programs to enhance the level of digital literacy among customers and its impact on secure digital banking use. In addition, as open banking and API platforms grow, third-party FinTech apps are able to make the transaction on the customer's account – this takes the trust boundary out further than the bank itself. Studies can look at whether or how the trust is governed in such open systems (the customer trusting the bank, or the FinTech app, or both). Generally, trust has been extensively studied, but maintaining trust is a moving target as there is new technology and threat vectors involved, therefore it is an active area of future research work.

•**Regulatory Challenges and Policy Evolution**: There is a high concentration on regulation in our bibliometric study, but this will fundamentally shift in the coming years. Most of the jurisdictions are yet to set rules for digital banks – e.g., how to treat deposit insurance for branchless banks, how to oversee their risk-taking, and how to create level playing fields between fintech entrants and incumbents. Future studies can offer timely advice by comparing regulatory outcomes across countries (what regulatory strategies best promote innovation without adding to systemic risk?). Additionally, subjects such as cryptocurrency and DeFi (Decentralized Finance) overlap with digital banking – several neobanks provide crypto trading or partner with De-Fi platforms, which also presents new regulatory issues. As an IMF study points out, high growth rates of fin-tech such as digital banks can introduce system-level threats and untested resilience. Studies can assist the regulators by simulating possible risk scenarios (e.g., what will be the consequences if a large neo-bank collapses, or how do digital-only banks withstand financial crises in comparison to the traditional banks?). The second lacuna is understanding the consumer protection dimension of digital-only banking – are current legislations sufficient to safeguard consumers of digital banks against fraud or cutting off of services? Follow-up studies must then address legal reforms or policy interventions uniquely tailored to the branchless banking model. In conclusion, policy research will remain significant to complement the business and technological innovations of digital banking.

•**Integration of Social Impact and Financial Inclusion:** While there are works that address financial inclusion, there is perhaps more to be done in measuring the social impact of digital-only banks. For example, do neo-banks really cater to unbanked or underbanked markets, or do they simply capture already-banked, younger urban residents? Quantitative studies of customer demographics at online-only banks in several regions could provide insight there. And if inclusion gaps are discovered to exist, studies could study the impediments (e.g., digital literacy, smartphone penetration, trust concerns among certain communities) and recommend solutions. Government or public-private initiative roles in popularizing digital banking in rural or marginal communities are another subject to study in detail. Fundamentally, seeing digital banking not merely as a business trend but as a tool to achieve social good can unlock new avenues of study. That might entail multi-disciplinary studies, bringing together lessons from development studies, economics, and technology uptake.

• **New Business Frontiers and Services**: As digital banks continue to expand the frontiers of innovation, new services are being developed – ranging from complete personal finance management, to access to salary in advance, to provision of crypto assets. Every new service is a research area. Some neo-banks, for instance, test subscription models (a fixed monthly fee for longer-term services) – what impact does that have on customer behaviour and satisfaction versus the traditional fee-per-service model? Others use highly algorithmic credit scoring to provide quick loans – what are the flaws or biases in these systems, and how do consumers feel about algorithmic financial decision-making? Investigating these emerging products and adoption can maintain scholarly research

in the forefront of the industry. Further, competition could induce cooperation: some incumbent banks have recently acquired or established their own digital-only brands, mixing incumbent and disruptor lines. Such hybrid models and success drivers could be considered in the future, whereas previously it was not a possibility when the story was merely fin-tech.

In these space areas of gaps, we find the research agenda for digital-only banks is still quite far from depleted. All such avenues of the future – sustainability, cutting-edge AI, evolving regulation – lie on the horizon of current clusters or merging beyond the confines of current clusters, and so the clusters of the future could turn out differently as the research continues. For example, five-year bibliometric analysis in the future can reveal a clear "AI in banking" cluster or a "crypto/De-Fi and digital banking" cluster if they attract sufficient research interest.

Filling these gaps will not only bring academic knowledge forward but also practical advice. Digital-only banks operate in a fast-changing world, and the principles of good research can assist them in innovating responsibly, building customer trust, and engaging positively with regulators. Similarly, research-influenced policymakers can develop well-balanced regulations that ensure consumer protection and stability without undermining the value of digital banking innovation.

IV. Conclusion

This bibliometric analysis aimed to chart the intellectual landscape of digital-only bank research from its beginning in the late 1990s to the current time. Our examination of ~28 years of literature presents a field that has expanded exponentially in terms of output and developed in terms of diversity of subject matter. We discovered that the number of publications on electronic banking has accelerated especially over the past decade, echoing the rapid development and relevance of the sector. Citation analysis emphasized both established studies (of the early 2000s) that continue to underpin the literature as well as recent high-impact research, evidencing a constructive tension between early foundation and cutting-edge investigation.

By applying co-occurrence network analysis, we uncovered five dominant thematic clusters in the literature: (1) Fin-Tech Adoption and Technology Use, (2) Trust and Security, (3) Digital Transformation and Business Models, (4) Customer Experience and Satisfaction, and (5) Regulation and Compliance. These themes reflect the multi-dimensionality of digital-only banking research. We talked through the emphasis of each cluster, from learning about user adoption drivers and trust processes, to examining strategic changes of banks and operating regulatory environments. The thematic map (Figure 3) and Table 1 present a formalised overview of what the research community has learned within this area.

The implications are numerous for academia. This bibliometric mapping here offers a distilled overview of extant knowledge and theory creation on digital banking. It facilitates researchers, particularly new researchers, to quickly understand what has been extensively researched (e.g., determinants of technology adoption) and which ones are new (e.g., sustainability in e-banking). By highlighting the most influential authors, journals, and books within each theme, our research serves as a roadmap to the literature. In addition, identifying those research gaps – including the absence of studies on AI integration, sophisticated trust solutions, and social effects of digital banks – can inform future research agendas. Research scholars can develop on this work to venture into those less-mapped areas so that the scholarship continues to remain relevant to developments in the world.

For banking practitioners and the industry, too, the takeaways are significant. The themes of research that cluster reflect the fundamental issues confronting digital-only banks. Executives at banks can observe that the academic community has always underscored the value of trust and security – this confirms that investments in strong security infrastructure and open

customer relations are essential to success. The broad body of research on customer satisfaction indicates that in addition to providing digital convenience, neo-banks need to constantly improve user experience and service quality in order to keep customers. Our digital transformation findings emphasize that incumbent banks going through digitization need to take note of success factors established in research (such as innovation culture and agility). In parallel, the regulatory thread is a reminder that regulator engagement and compliance mastery are not merely back-office concerns but can determine market credibility and digital bank longevity.

The timing of this report is also significant. As of 2025, digital-only banks have moved from insurgent disruptors to mature players in most markets, but the landscape keeps changing with new technologies (AI, block chain) and changing economic circumstances. The holistic overview provided by this paper occurs at a time when taking stock of past studies can help shed light on the way forward. We highlight that ongoing partnership between researchers, industry, and regulators will remain crucial. Scholars offer theory and evidence to shape practice, industry offers use-cases and real-world data, and regulators offer assurance that the ecosystem develops in a sustainable manner – a balance that can respectively support the positive development of digital banking.

By way of summary, the bibliometric study of research into digital-only banking highlights a mature and increasingly rich subject of study. Fundamental knowledge has been developed within domains of technology take-up, trust establishment, and business development for digital banks. However, emerging questions persist with technological innovation and social evolution. We call on researchers to fill in the gaps, including the incorporation of AI and consideration of sustainability, as they will define the next generation of digital banking. The findings of this research not only chronicle the scholarly path to date but also act as a guide for researchers and practitioners charting the course of banking in an entirely digital era.

VI References

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