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Contact to corresponding author: George Lăzăroiu, george.lazaroiu@spiruharet.ro

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George Lăzăroiu

Spiru Haret University, Romania

 orcid.org/0000-0002-3422-6310


Mădălina Bogdan

Spiru Haret University, Romania

 orcid.org/0000-0002-3196-1432


Marinela Geamănu

Spiru Haret University, Romania

 orcid.org/0000-0003-4054-4865


Lăcrămioara Hurloiu

Spiru Haret University, Romania

 orcid.org/0000-0002-4015-6101


Luminița Ionescu

Spiru Haret University, Romania

 orcid.org/0000-0001-9829-7524

Roxana Ștefănescu

Spiru Haret University, Romania

 orcid.org/0000-0003-4762-3814

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Artificial intelligence algorithms and cloud computing technologies in blockchain-based fintech management

JEL Classification: E42; J33; O14

Keywords: *artificial intelligence algorithms; cloud computing; blockchain; fintech; green and sustainable finance; banking*

Abstract

Research background: Fintech development shapes corporate investment efficiency and economic growth with innovative tools, and can decrease financing constraints of enterprises, enabling direct and indirect financing and furthering inter-bank competition. Crowdfunding- and blockchain-based fintech operations harness deep and machine learning algorithms, augmented and virtual reality technologies, and big data analytics in mobile payment transactions.

Purpose of the article: We show that fintechs have reconfigured financial service delivery by harnessing AI-based data-driven algorithms and cloud and blockchain technologies. Fintech optimizes financial organization and services, economic structures and growth, data analysis, and digital banking performance. Machine learning algorithms can streamline payment operation capabilities and process promptness, ensuring smooth operational flows, assessing risks, and detecting frauds and money laundering by historical data and customer behavior analysis across instant payment networks and infrastructures.

Methods: Quality tools: AXIS, Eppi-Reviewer, PICO Portal, and SRDR. Search period: July 2023. Search terms: “fintech” + “artificial intelligence algorithms”, “cloud computing technologies”, and “blockchain technologies”. Selected sources: 40 out of 195. Published research inspected: 2023. Data visualization tools: Dimensions and VOSviewer. Reporting quality assessment tool: PRISMA.

Findings & value added: Fintech development enables organizational innovation by mitigating information asymmetry and financing limitations while providing financial assistance and tax incentives in relation to products and services. The fintech growth has influenced the dynamic intermediary function of financial institutions in terms of sustainability and economic development. Fintech and natural resources negatively influence, while green innovations and financial development further, environmental sustainability.

Introduction

Financial technology (fintech) integrates blockchain and non-fungible tokens (NFTs) in the immersive metaverse environment by using cryptocurrencies across the virtual portable and reusable good and service market for real estate transactions, ownership and exchange models, and convertible investments, boosting user satisfaction and loyalty, and configuring digital wallet infrastructures. Decentralized Web3, hybrid cloud, and dis-

tributed ledger technologies facilitate e-commerce payments and transactions, furthering cryptoasset purchases through digital currencies and deploying crowdsourced and triangulated data source analysis, behavioral biometrics, and intuitive, immersive, and real-time authentication processes.

The research gap is filled by showing how blockchain-based decentralized digital autonomous organizations increase operational efficiency and generate business value through investment management, mobile payments, financial service and process automatization, and digital banking through augmented and virtual reality technologies by use of data visualization, quality, and reporting quality assessment tools. Metaverse fintech can build a streamlined payment infrastructure through blockchain and digital twin technologies for multi-way immersive authentication throughout seamless digital financial transactions and across the cryptocurrency market.

This systematic review shows that fintech is pivotal in innovation and entrepreneurship by integrating big data, artificial intelligence (AI), deep and machine learning, and blockchain (Chaklader *et al.*, 2023) in financial services and institutions, banking operations, and stock markets. Big data analytics and blockchain technologies (Sharma *et al.*, 2023a) further sustainable fintech systems and green and AI-based index funds. The fintech growth has influenced the dynamic intermediary function of financial institutions in terms of sustainability and economic development, corporate innovation and capital investments, and market structure, perceived risks, and regulations related to lending and payment (Rafiuddin *et al.*, 2023) by use of blockchain technology-based data provision, service design and delivery, and behavioral patterns. Fintech operations develop on AI Internet of Things (IoT), big data analytics, and blockchain technologies with regard to green and sustainable finance, renewable energy, and environmentally friendly products and services (Mirza *et al.*, 2023) so as to coherently assess and decrease climate change risks. Fintech development shapes corporate investment efficiency and economic growth with innovative tools, being pivotal even with financial constraints, private interests, downside risks, limited resources, and agency conflicts (Sun & Zhang, 2023) throughout governance features of the external financing ecosystem and internal corporate investment behavior and decisions.

The manuscript is organized as following: methodology; digital and technological innovation-based mobile financial and banking services and

products; cloud technologies and AI in blockchain-based fintech payment data analytics; financial organizational environmental sustainability by use of fintech and green finance; discussion and results; conclusions; specific contributions to the literature; limitations and further directions of research; and practical implications.

Method

Quality tools: AXIS (evaluating cross-sectional study quality), Eppi-Reviewer (machine learning-based data collection, management, and analysis in literature reviews for research synthesis in terms of study screening process, text mining, reference and review management, article classification, data extraction and clustering, and synthesis), PICO Portal (artificial intelligence- and natural language processing-based management tool in systematic reviews for quality assessment, full-text content, data extraction, citation screening, and accurate de-duplication, enabling collaborative knowledge synthesis), and SRDR (a collaborative archive of systematic review data and a data extraction tool for text analysis). Search period: July 2023. Search terms: “fintech” + “artificial intelligence algorithms”, “cloud computing technologies”, and “blockchain technologies”. Selected sources: 40 out of 195 (Table 1). Published research inspected: 2023. Data visualization tools: Dimensions and VOSviewer. Reporting quality assessment tool: PRISMA (Figures 1–5).

Citation correlations as regards co-authorship show how blockchain technology-based fintech companies harness Artificial IoT and big data analytics in investment decisions, share prices, financial inclusion, and market capitalization (Rafiuddin *et al.*, 2023), boosting economic growth. AI can develop algorithms that inspect blockchain data and configure patterns informing trading approaches (Jareño & Yousaf, 2023) as regards cryptocurrencies and tokens, and fraud detection algorithms in transactions (Figure 2).

Citation correlations as regards citation show fintech is pivotal in money transfer and payments, budgeting and financial planning, lending and borrowing, savings and investments, and insurance and portfolio decisions (Rafiuddin *et al.*, 2023) by deploying AI algorithms, big data analytics, and blockchain technologies. Crowdfunding- and blockchain-based fintech operations harness deep and machine learning algorithms, augmented and

virtual reality technologies, and big data analytics in mobile payment transactions for banking and finance service innovation and value co-creation development (Sun *et al.*, 2023; Yang *et al.*, 2023) through green innovation and digitalization approaches (Figure 3).

Citation correlations as regards bibliographic coupling show how fintech products and services are developed through blockchain technologies, deep and machine learning, and big data (Thomas *et al.*, 2023) that enhance financial system mechanisms in relation to credit markets and digital lending platforms. Human capital performance, firm volume, and market concentration shape bank profitability, sustainability-related goals, and green finance and lending decision (Mirza *et al.*, 2023) by integrating big data analytics, deep and machine learning algorithms, and blockchain technologies (Figure 4).

Citation correlations as regards co-citation show how process automation and digitization in financial markets and assets deploy IoT and blockchain technologies, machine learning algorithms, and big data analytics (Jareño & Yousaf, 2023) for financial products and services. Big data analytics, cloud computing, and blockchain technologies configure a positive link between fintech investments and services and economic performance (Campanella *et al.*, 2023) through process automation and operating cost decrease (Figure 5).

Digital and technological innovation-based mobile financial and banking services and products

Machine learning-based fintech enable bank credit rating and lending across digital financial markets (Ahelegbey *et al.*, 2023), enhancing sustainable finance, credit rating trustworthiness, and financial conditions, performance, and inclusion. AI-based fintech can diminish operational risk in banks (Cheng & Qu, 2023) as regards interest, leases, services, and dividends. Fintech mobile payment, equity crowdfunding, and lending services integrate mobile payment and business transactions (Sharma *et al.*, 2023b), improved credit availability, and blockchain-based supply chain financing and operational decisions. AI-based financial technology (FinTech) can improve customer experiences and perceptions (Arora *et al.*, 2023) in terms of service quality and perceived convenience and usefulness. Machine learning algorithms can precisely predict organizational financial

performance, optimizing informed decision-making (Babaei *et al.*, 2023) as regards financial services.

Digital and technological innovation-based mobile financial and banking services and products (e.g., crowdfunding and crypto-currencies) enable swift and secured transactions and payments (Ben Romdhane *et al.*, 2023) by use of artificial intelligence, big data, and blockchain technologies. Fintech can assist financial institutions in bank lending process digitalization and in overcoming information asymmetry (Mikhaylov *et al.*, 2023), improving financial and equity market development and capitalization. Generative fintechns, predictive automation and digital advisory tools, and deep machine and reinforcement learning systems can drive operational efficiencies in product and service innovation, credit risk management, tech-driven payments, and consumer engagement and lending technologies.

Fintech and natural resources negatively influence, while green innovations and financial development further, environmental sustainability, reducing carbon and ecological footprints, and economic growth, leading to higher emissions by not incorporating sustainable management practices in terms of production and consumption patterns (Lisha *et al.*, 2023), thus resulting in environmental degradation and natural resource depletion. Fintech development can decrease financing constraints of enterprises, enabling direct and indirect financing and furthering inter-bank competition, the direct mitigating consequences being stronger for innovative and competitive companies and for firms having an unsatisfactory degree of social responsibility performance (Guo *et al.*, 2023), reducing information asymmetry issues. The corporate debt default risk is diminished and the impact of fintech on the corporate debt default risk is increased (He *et al.*, 2023) by deploying industrial policies.

Cloud technologies and AI in blockchain-based fintech payment data analytics

By integrating blockchain and cloud computing technologies, AI algorithms, and big data analytics (Dong & Yu, 2023), fintech development enables organizational innovation by mitigating information asymmetry and financing limitations while providing financial assistance and tax incentives in relation to products and services. Fintech innovations can assist

in enhanced resource utilization, green economic activity, and sustainable economic development (Awais *et al.*, 2023; Ha, 2023), controlling global warming and improving business performance, while curbing climate change effects and natural resource depletion by use of blockchain and cloud computing technologies. Fintechs have reconfigured financial service delivery by harnessing AI-based data-driven algorithms and blockchain technologies to carry out and smooth traditional banking operations and transactions, cryptocurrencies, and investment management (Almansour, 2023), establishing meaningful connections between and shaping work performance, job opportunities, operational efficiency and productivity, and organizational engagement.

Blockchain-based fintech payment data analytics increases financial market scalability, commercial real estate lending, investment range, asset management performance, transaction speed and volume, trade finance, and credit market development (Rjoub *et al.*, 2023), resulting in economic growth and profit margin enhancement. Fintech development decreases commercial bank credit risk level, enabling business innovation and optimizing risk prevention and control (Zhang *et al.*, 2023) by use of cloud technology and artificial intelligence. Digital twin, edge computing, remote sensing, and digital wallet technologies are deployed in blockchain- and metaverse-based decentralized financial, transaction, and credit systems in Web3 digital environments.

FinTech services integrate mobile wallets and payments, crowdfunding, cryptocurrency, invoice trading, platform-driven supply chain finance, and peer-to-peer digital lending (Sharma *et al.*, 2023b), leading to digital economy development. Crowdlending, crowdfunding, blockchain, and cryptocurrency (Alaassar *et al.*, 2023) further the sustainable development of fintech innovations. Service innovation is instrumental in firm growth by use of fintech in terms of virtualized business transactions (Bhutto *et al.*, 2023), expediting automation procedures and decision-making coherently while strengthening financial performance in the banking industry. Considering cost efficiency, deposit inflow, and risk management (Guo & Zhang, 2023), banks having increased fintech development bring about more liquidity. Machine learning techniques can consistently perform systematic financial risk assessment and analysis (Cheng, 2023) in the fintech sector. Fintech enables innovation across financial markets and commercial banks (Chen *et al.*, 2023), resulting in bank loan price decrease.

Financial organizational environmental sustainability by use of fintech and green finance

Fintech transactions and payment systems integrate cryptocurrencies and peer-to-peer lending by use of blockchain-based financial technology, artificial IoT, and AI algorithms (Rjoub *et al.*, 2023) optimizing financial service automation and banking performance in credit market and payment services, and insurance systems. Fintech development can cut down enterprise credit costs (Chen *et al.*, 2023), bringing about coherent consequences on bank loan prices. Fintech and green finance further financial organizational environmental sustainability (Guang-Wen & Siddik, 2023) by integrating digital and mobile banking across operations. Through contactless and cryptocurrency payments and mobile wallets, fintech-based supply chain finance and payment services further trade credit, cash flows, and bank loans (Sharma *et al.*, 2023b) by use of computational agent-based modeling tools and machine learning algorithms. Assessing and monitoring customer convenience and readiness, sentiment, acceptance and usage decision, and value creation in terms of frequency and volume in relation to fintech product and services across mobile payment, trade, and investment areas (Mahmud *et al.*, 2023) require deep and machine learning algorithms in a digital infrastructure environment. Cloud technology- and machine learning algorithm-based market operation transparency and transaction cost reduction (Mikhaylov *et al.*, 2023) optimize digital bank and financial service automation.

Blockchain-based and AI fintech can mitigate financing pressure on corporations and shape corporate investment efficiency (Sun & Zhang, 2023), and the inhibitory consequences of fintech on corporate overinvestment is noticeable with increasing agency conflict. Sustainable Bitcoin, fintech, and AI stock investments can influence environmentally friendly assets such as green bonds in relation to clean energy (Abakah *et al.*, 2023) in terms of distributional and directional predictability. Fintech shapes the firm development internal and external environment and may diminish the enterprise debt default risk (He *et al.*, 2023) by mitigating corporate financing constraints. Fintech development can considerably decrease the corporate debt default risk (He *et al.*, 2023) for high-tech companies having a small volume of investment opportunities, shaping banking operations, financial data, risk, and performance. Firm digitalization can

diminish bank loan prices and mitigate fintech policy effects (Chen *et al.*, 2023) in curtailing loan prices.

Results and discussion

AI-driven data-sharing process streamlining, machine learning algorithms, and 3D and virtual reality data visualisation tools (Arora *et al.*, 2023; Chaklader *et al.*, 2023; Guang-Wen & Siddik, 2023) assist hyper-personalised digital financial and banking services, digital asset purchases, and NFT trading (Alaassar *et al.*, 2023; Cheng, 2023; Sharma *et al.*, 2023a) in blockchain-based data marketplaces and across 3D extended reality and immersive environments (Bhutto *et al.*, 2023; Mikhaylov *et al.*, 2023; Rafiuddin *et al.*, 2023), building meaningful connections and a competitive advantage (Chen & Guo, 2023; Ha, 2023; Kazachenok *et al.*, 2023). Metaverse fintech handles virtual asset-based interest payments, investments and speculations, mortgages and leases, transactions, and rentals by use of 5G, 3D, blockchain, Web3, and virtual reality technologies (Dong & Yu, 2023; Mirza *et al.*, 2023; Zhang *et al.*, 2023), articulating immersive, accessible, engaging, interactive, convenient, and personalized banking services and experiences (Abakah *et al.*, 2023; Chen *et al.*, 2023; Mahmud *et al.*, 2023).

Autonomous financial systems and decentralized self-governing organisations integrate mobile payments, virtual loans, insurance policies, in-game microtransactions, stock trading, monetary settlements, exchanges and transactions, peer-to-peer lending, credit cards, online investment systems, in-app purchases, mortgages, and crowdfunding (Awais *et al.*, 2023; Guo & Zhang, 2023; Sun & Zhang, 2023) across immersive 3D simulated and collaborative digital environments and decentralized marketplaces. Immersive 3D blockchain- and metaverse-based decentralized virtual marketplaces and financial systems and transactions (Ben Romdhane *et al.*, 2023; Sun *et al.*, 2023; Yang *et al.*, 2023) shape metaverse fintech, articulating seamless cashless financial transactions, products, and services and building enhanced customer loyalty, engagement, and experiences (Akmal *et al.*, 2023; Cheng & Qu, 2023; Rafiuddin *et al.*, 2023).

Peer-to-peer blockchain networks, decentralized financial systems, and virtual asset and financial data management (Almansour, 2023; Jareño & Yousaf, 2023; Lisha *et al.*, 2023) enhance digital credit products and services, asset trading and monetization, and banking experiences (Babaei *et*

al., 2023; Ha, 2023; Thomas *et al.*, 2023) through cryptocurrency adoption and metaverse wallets. Generative AI and machine learning algorithms enable transaction and authorization processing, personalized financial advice, automated loan approvals, and seamless mobile banking (Campanella *et al.*, 2023; Guo *et al.*, 2023; Rjoub *et al.*, 2023), improving operational efficiency in relation to customer profiling, credit and transaction history, lending practices, and spending patterns (Ahelegbey *et al.*, 2023; He *et al.*, 2023; Sharma *et al.*, 2023b), flagging financial crime, fraud patterns, and risky investments through data management techniques (Gonçalves *et al.*, 2023; Su & Xu, 2023; Tan *et al.*, 2023).

Blockchain technology-based fintech companies develop on cognitive artificial intelligence algorithms, smart and sensing technologies, and retail data measurement tools (Andronie *et al.*, 2021; Peters *et al.*, 2023; Zvarikova *et al.*, 2022a) in immersive hyper-connected virtual spaces. Fintech products and services integrate cognitive artificial intelligence and machine vision algorithms, movement and behavior tracking tools, and customer identification and immersive technologies (Barbu *et al.*, 2021; Kovacova *et al.*, 2022; Zvarikova *et al.*, 2022b) in relation to customer experiences in the Web3-powered metaverse world. Computer vision and acoustic environment recognition algorithms, geospatial mapping and digital twin modeling tools, and neural network and deep learning-based sensing technologies (Durana *et al.*, 2022; Nagy & Lăzăroiu, 2022; Zauskova *et al.*, 2022) configure fintech transactions and payment systems in the metaverse interactive environment and in blockchain-based virtual worlds. Big data analytics tools, deep neural networks, virtual simulation and machine learning algorithms, autonomous robotic technologies, and cloud-based accounting information systems (Ionescu, 2021; Nagy *et al.*, 2023; Rowland *et al.*, 2021) articulate blockchain-based and AI fintech.

Brand value sources shape sustainability management and performance of the fintech-based banking sector (Gajanova *et al.*, 2020; Lăzăroiu *et al.*, 2020a; Pop *et al.*, 2022) as regards customer intentions, attitudes, and behaviors in the urban corporate economy. Virtual navigation tools, human-like AI devices, and image processing computational algorithms optimize interaction quality across economic decision-making patterns (Grupac *et al.*, 2022; Lăzăroiu *et al.*, 2017; Pelău *et al.*, 2021) in blockchain-based fintech payment data analytics in the service industry and in the metaverse commerce by use of immersive and cognitive technologies. Big data processing techniques and algorithmic decision intelligence and modeling

tools are pivotal in socially interconnected virtual services and in blockchain-based fintech and cloud-based accounting information systems (Ionescu, 2022; Konhäusner *et al.*, 2021; Nica *et al.*, 2022) across the metaverse ecosystem through monetary incentivization, articulating multisensory customer experiences. Behavioral predictive analytics, marketing communication effectiveness, spatial computing technology, environmentally responsible behavior, and simulation modeling tools (Krizanova *et al.*, 2019; Lăzăroiu *et al.*, 2020b; Valaskova *et al.*, 2022) enable fintech mobile payments in the metaverse economy.

Conclusions

Blockchain-based fintech systems boost the gross domestic product brought about by the financial sector, together with portfolio optimization, e-commerce turnover, investment management operations, risk mitigation, and real estate financing (Rjoub *et al.*, 2023) by reducing loan rates, handling rising market demands coherently in the digital environment and across decentralized network ecosystems. Fintech adoption shapes green finance, green innovation, and environmental performance relevantly, enabling sustainable economic development (Guang-Wen & Siddik, 2023) through remote customer service, carbon emission and energy use decreasing, and blockchain technologies.

Fintech optimizes financial organization and services, economic structures and growth, data analysis, and digital banking performance through effective decision-making, coherent interconnectivity, and operational efficiency across entrepreneurial ecosystems (Akmal *et al.*, 2023), resulting in increased financial accessibility and inclusion, and in risk mitigation in relation to bitcoin and automated trading. Fintech can considerably reduce credit corruption and related expenses through risk detection, data mining, and inclusive development in organizations having transparent information disclosure, adjusting resource misdistribution generated by credit corruption while furthering corporate investment efficiency (Su & Xu, 2023), enabling financial inclusiveness, and mitigating corporate finance constraints.

Specific contributions to the literature

Our analyses particularly prove that the fintech-based banking sector integrates blockchain technology across digital finance, cryptocurrencies, transaction services, and loan risk management (Rjoub *et al.*, 2023), leading to innovative economic growth. As a result of perceived role congruity, with regard to personal loans, rejection by an AI fintech system (Gonçalves *et al.*, 2023) brings about an increased degree of satisfaction relative to rejection by a credit analyst. Bank fintech improves corporate innovation by reducing the inhibitory consequences of financing limitations and management expenses (Tan *et al.*, 2023): the positive effect is noticeable in companies having unsatisfactory financial endowments and private enterprises. Fintech development shapes enterprise and organizational innovation (Chen & Guo, 2023) by use of digital technologies in financial services. Fintech is quite operational in improving the investment efficiency of companies having more substandard internal governance (Sun & Zhang, 2023) while also having a lesser amount of financing capabilities, counterproductive capital distribution, more critical agency conflicts, and less investment prospects.

Limitations and further directions of research

Only papers covering AI algorithms and cloud computing technologies in blockchain-based fintech management and indexed in ProQuest, Scopus, and the Web of Science, and published in 2023, were analyzed. Subsequent interest should inspect algorithmic modeling of green transactions and fintech lending services resulting in sustainable competitive advantage. Machine learning algorithms can streamline payment operation capabilities and process promptness, ensuring smooth operational flows, assessing risks, and detecting frauds and money laundering by historical data and customer behavior analysis across instant payment networks and infrastructures. The scope of this research does not advance how fintech harnesses blockchain and cloud computing technologies in corporate investments and in bank performance improvement. Future papers should investigate green computing and machine learning technologies, artificial neural networks, and big data analytics in fintech development through sustainable resource utilization.

Practical Implications

Neuro-symbolic AI and federated machine and reinforcement learning algorithms can generate tangible business outcomes and operational efficiency, bolster productivity and asset performance, and build sustainable business decisions in relation to AI algorithms and cloud computing technologies in blockchain-based fintech management, enhancing digital customer sentiment, confidence, and experiences by assessing spending habits, buying behaviors, and purchase drivers through extensive and robust data trails, while driving emission reduction towards a sustainable net-zero economy. Fintech innovations can bring about green economic growth by reducing environmental damage, carbon emissions, and unsustainable economic activity (Awais *et al.*, 2023; Ha, 2023), while optimizing blockchain-based renewable energy trading, clean financial operations and services, and organisational performance outcomes. Causal relationships of investment decision-making process organization, management, and automation (Kazachenok *et al.*, 2023) articulate fintech corporate management, sustainable development, and social responsibility through blockchain technologies.

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Annex

Table 1. Topics and types of paper identified and selected

Topic	Identified	Selected
fintech + artificial intelligence algorithms	67	14
fintech + cloud computing technologies	65	13
fintech + blockchain technologies	63	13
original research	162	37
review	9	3
conference proceedings	16	0
book	2	0
editorial	6	0

Note: some topics overlap.

Figure 1. PRISMA flow diagram describing the search results and screening

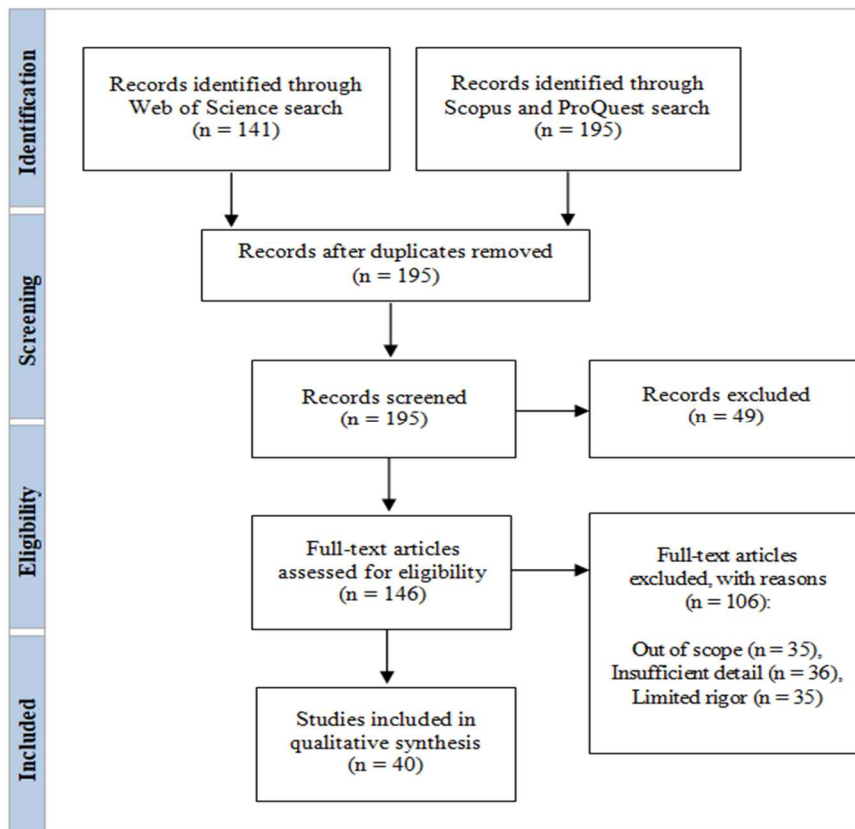


Figure 2 Co-authorship

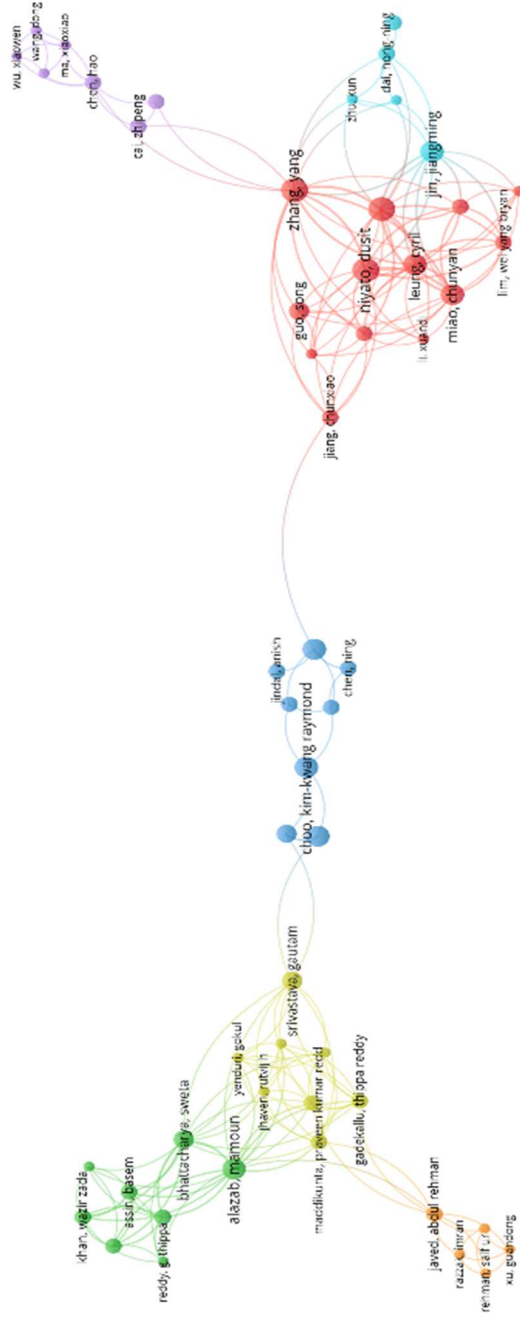


Figure 3 Citation

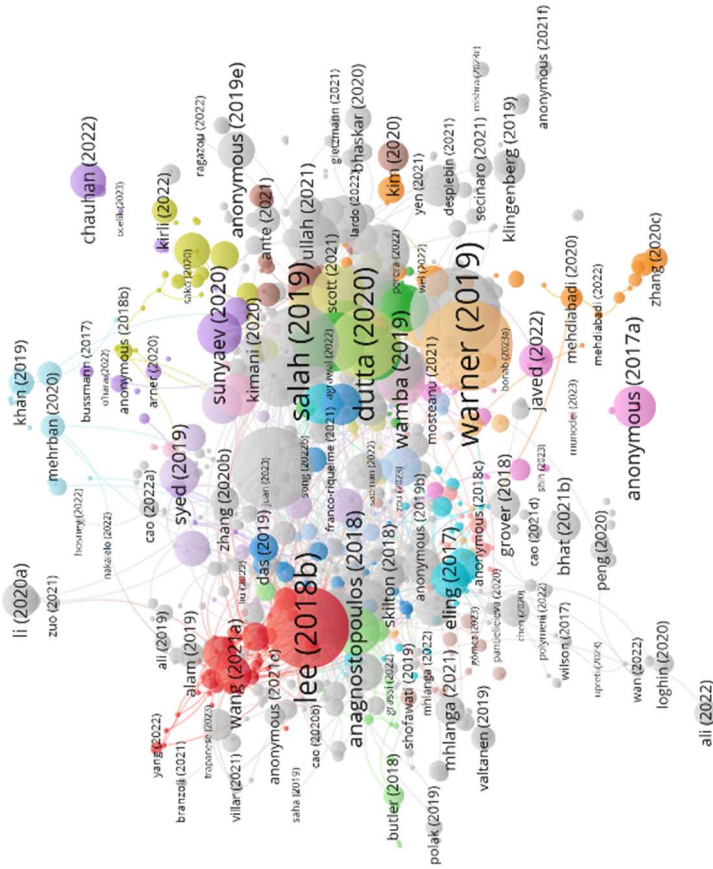


Figure 4 Bibliographic coupling

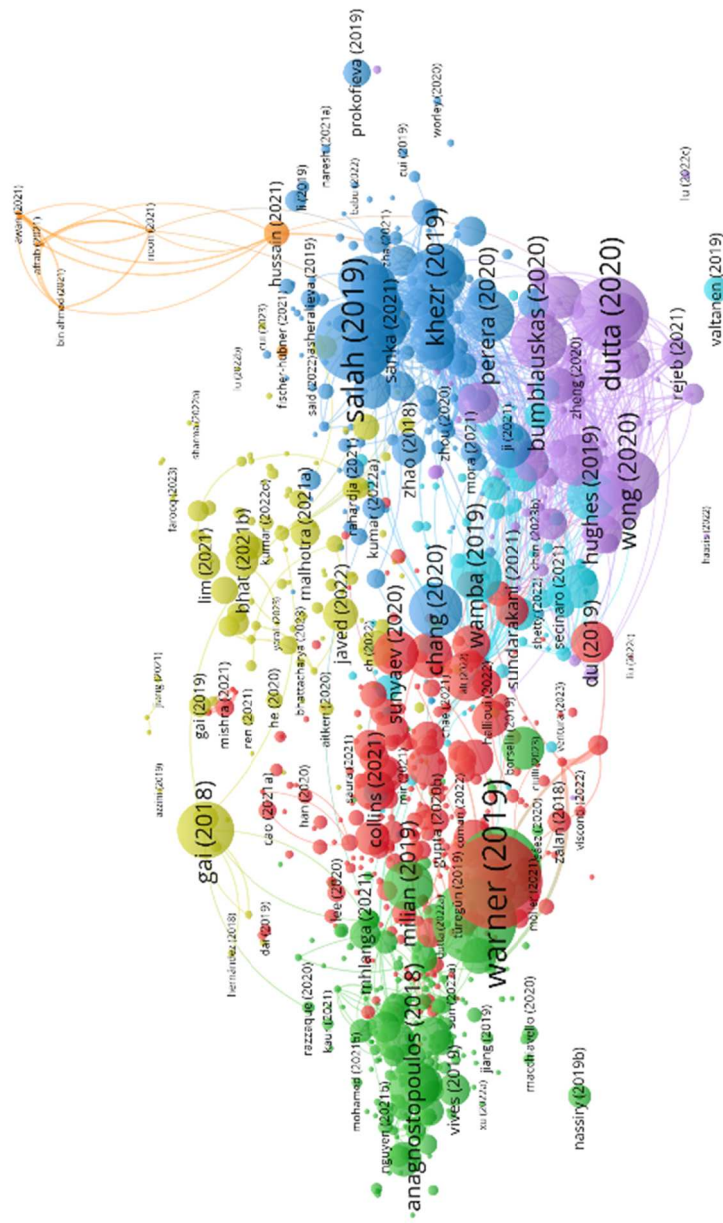


Figure 5 Co-citation

