

Bibliometric analysis of research trends in mobile telecommunications service quality

Andreea-Raluca DESPA

0009-0007-6861-7364

Vodafone Intelligent Solutions, Bucharest
andreea.despa@stud.etti.upb.ro

Cătălina-Ileana RACHERU

0009-0000-8677-4477

Vodafone Intelligent Solutions, Bucharest
catalina.racheru@stud.etti.upb.ro

Gheorghe MILITARU

0000-0003-4650-8427

National University of Science and Technology POLITEHNICA Bucharest
gheorghe.militaru@upb.ro

Abstract. Researchers and industry stakeholders have been paying more attention to the quality of mobile telecommunications services in recent years, particularly as 5G technologies are being deployed more quickly and user expectations are becoming more complex. In order to identify significant authors, journals, keywords, and thematic trends, this study offers a thorough bibliometric analysis of scientific research in the area of mobile telecom service quality. The Bibliometrix R-package and VOSviewer were used to perform the analysis, which was based on 177 publications that were indexed in the Scopus database between 2000 and 2025. The results show that scholarly interest has been steadily increasing, that user-centric approaches (QoE and satisfaction) are replacing purely technical performance indicators (such as QoS), and that new themes like AI integration, Agile frameworks, and service innovation are emerging. The intellectual terrain of telecom service quality research is systematically reviewed in this paper, which also identifies important areas for further investigation.

Keywords: quality, telecommunications, customer experience, user satisfaction, quality of experience, agile

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Introduction

Global communication has undergone a significant transformation thanks to the growth of mobile telecommunications, which has made data-intensive services, ubiquitous connectivity, and real-time interactions possible. Mobile networks have developed into vital infrastructure in recent years, supporting digital innovation, public services, and economic activity. Expectations for network performance are raised by the 4G to 5G and 6G transitions, as well as by the complicated issues surrounding service quality and user satisfaction.

At first, the ITU-T and ETSI-standardised Quality of Service (QoS) metrics, including throughput, latency, jitter, and packet loss, were the main focus of the assessment of service quality in telecommunications [1]. However, especially in contemporary networks where services are layered, customised, and dynamically provisioned, these technical metrics frequently fall short of capturing the user's overall experience. A complementary framework that encompasses the contextual, behavioural, and perceptual elements of user interaction with telecom services is the Quality of Experience (QoE) concept [2].

Researchers have been concentrating more on closing the gap between network-level performance and user-level perception during the last 20 years. As a result, the telecom sector adopted assessment models like SERVQUAL, Net Promoter Score (NPS), and Lean Six Sigma [3]. Furthermore, a key component of contemporary

service management in mobile networks is the integration of data-driven quality monitoring, agile approaches, and customer satisfaction metrics [4].

Notwithstanding this expanding corpus of work, a systematic synthesis of the development and organisation of the scientific literature in this area is lacking. A strong methodology for tracing thematic trends, identifying important contributors, mapping the intellectual landscape, and identifying research gaps is provided by bibliometric analysis [5]. Researchers can now conduct in-depth analyses of publication patterns, co-citation networks, keyword co-occurrence, and thematic evolution thanks to tools like Bibliometrix and VOSviewer.

This study uses bibliometric techniques to analyse a selected collection of 177 publications on mobile telecommunications service quality from the Scopus database (2000–2025). The primary goal is to present a thorough summary of the research activity in this area, emphasising significant publications, new subjects, and promising avenues for further investigation.

The central research question guiding this work is: What are the dominant themes, influential authors, and emerging research directions in the field of mobile telecommunications service quality between 2000 and 2025?

The following hypotheses are put forth in light of prior research and patterns that have been noticed. First, it is anticipated that user-centered approaches (QoE and satisfaction) have replaced technical performance (QoS) as the primary focus of research. Second, interdisciplinary efforts that integrate service management, user experience, and telecommunications engineering are probably going to make the most significant contributions in this field. Third, it is predicted that new topics like AI-driven service optimisation, Agile project management, and quality assurance in next-generation (5G/6G) networks will be covered more frequently in recent publications.

Literature review

Over the past 20 years, there has been a substantial conceptual and methodological evolution in the study of mobile telecommunications service quality. The literature can be divided into three main research streams: managerial models for quality improvement in telecom environments, user-centric quality perception (QoE), and technical performance evaluation (QoS). Quality of Service (QoS), a technical framework for assessing network-level performance metrics like bandwidth, latency, jitter, and availability, was the first area of emphasis in the literature. Numerous studies have underlined how crucial it is to uphold stringent QoS guarantees, especially for real-time services like online gaming, VoIP, and video streaming [6]. Despite being measurable, QoS metrics frequently fall short in capturing the contextual and subjective aspects of users' perceptions of service quality.

Due to this constraint, Quality of Experience (QoE) is increasingly being used as a supplemental strategy. Human-centric elements like emotional response, user expectations, service context, and perceived fairness are integrated with technical parameters in QoE [7]. Recent studies show that QoE is influenced by social context, device characteristics, interface usability, and content relevance in addition to network performance [8]. In this sense, QoE has emerged as a key differentiator for telecom companies looking to keep customers and lower attrition in crowded markets [9].

Agile approaches, Lean Six Sigma, and AI-based optimisation have all been brought to the quality management scene in recent years by interdisciplinary contributions. Because they improve flexibility and integrate user feedback, agile project management frameworks like Scrum and SAFe are being used more and more in network operations and service design [10]. At the same time, new opportunities for real-time QoS and QoE improvement have been made possible by the application of artificial intelligence in predictive maintenance, network traffic optimisation, and anomaly detection [11].

The idea of service quality is changing as 5G and soon-to-be 6G networks are deployed. The impact of ultra-low latency, network slicing, edge computing, and massive device connectivity on customer satisfaction and perceived service quality is being investigated in new research. These advancements mark a shift in the mobile telecommunications industry towards more intelligent, flexible, and dynamic quality management systems. Notwithstanding this substantial corpus of work, integrative studies that chart the development, organisation, and future paths of mobile telecom service quality research are scarce. This study fills this knowledge gap by examining the scientific environment in this field from 2000 to 2025 using bibliometric techniques [12].

Methodology

This study uses a quantitative, exploratory design grounded in bibliometric analysis to map the thematic development and intellectual structure of academic publications on the quality of mobile telecommunications services. In the field of information science, bibliometric techniques are frequently used to find co-authorship patterns, influential authors and institutions, publication trends, and keyword co-occurrence networks.

The following advanced query was used to retrieve the dataset from the Scopus database: ("telecommunications" OR "mobile network" OR "5G" OR "4G" OR "LTE") AND ("quality of service" OR "QoS" OR "service performance" OR "user experience" OR "quality of experience") AND ("Agile" OR "Agile project management" OR "Scrum" OR "Kanban" OR "Agile software development" OR "Project management in telecom"). 177 pertinent scientific publications, including journal articles, conference papers, and reviews, were found by this search between 2000 and 2025. Three primary research dimensions were the focus of the inclusion criteria, which restricted the selection to English-language publications. These were: the development of mobile telecommunications infrastructure (2G–5G); quality of service and user experience (QoS/QoE); and the use of Agile methodologies in telecom project management. During preprocessing, duplicates and unnecessary records were eliminated.

Two software tools were used to perform the bibliometric analysis. VOSviewer was utilised to create and display bibliometric networks like co-authorship, keyword co-occurrence, and thematic clustering, while Bibliometrix, an open-source R package, was utilised for statistical and science-mapping analysis. Four steps comprised the research design: metadata preprocessing and normalisation; descriptive analysis of yearly production, sources, and citations; network analysis of author and keyword relationships; and thematic mapping using Callon's centrality and density indicators. This process made sure that emerging topics, niche areas, and motor themes were identified. T

The study builds on earlier bibliometric research in quality management and telecommunications, but sets itself apart by combining managerial techniques like SERVQUAL, Agile, and NPS with both technical (QoS) and user-centric (QoE) viewpoints. All analyses were carried out using Bibliometrix in RStudio (v4.3.2) and network visualisation in VOSviewer (v1.6.20). The figures were then polished in Microsoft PowerPoint before being included in the article.

Results and further discussions

177 publications that were indexed in Scopus between 2000 and 2025 were the subject of the bibliometric analysis. Four primary dimensions are used to present the results: thematic evolution, source and citation impact, keyword co-occurrence, and scientific production. The suggested hypotheses (H1–H3) are then examined in relation to these findings.

The yearly scientific output shows a consistent rise in publications, especially after 2015, when 5G research gained momentum and user-centric service quality models became more and more in demand. With more than 20 papers published in 2021, output peaked, indicating the field's growing importance. This result confirms H1, which proposed a change in emphasis from strictly technical QoS research to more integrative methods that take user satisfaction and QoE into account.

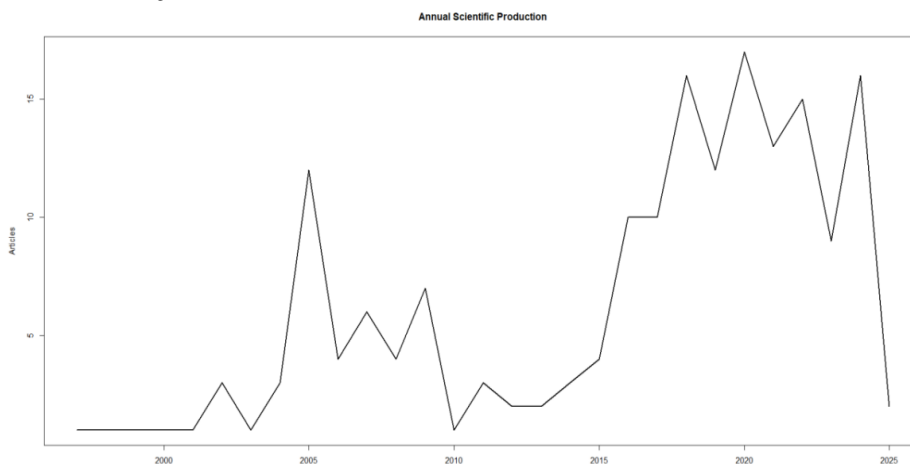


Figure 1: Annual scientific production (2000–2025)

Source: Author's own contribution

Although related fields like cloud computing and the Internet of Things have seen comparable increases in publication volume, the COVID-19 pandemic and the spike in mobile data traffic around 2020–2021 are when the acceleration in mobile telecommunications service quality is most noticeable. This demonstrates how resilient

mobile services are becoming more and more important to society and the economy. Geographically speaking, the data indicates that research output from Asia and North America, specifically, China, the US, and India dominates the field. Although there are fewer European contributions, they frequently concentrate on managerial and regulatory viewpoints, which enhances the field's interdisciplinary character. Emerging contributions from nations like Romania show how inclusive this field of study is becoming and suggest that scholarly activity will continue to diversify in the future.

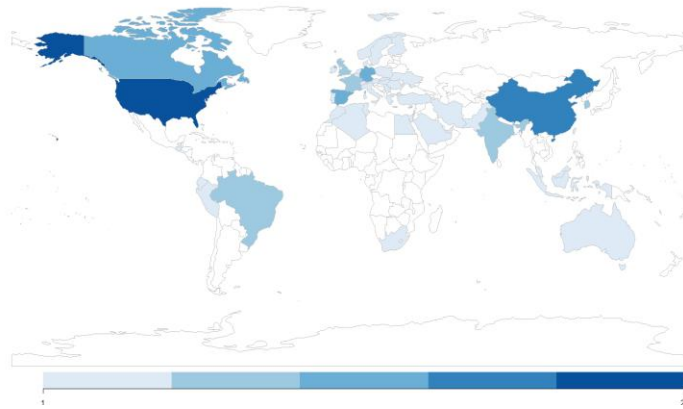


Figure 2: Country scientific production (2000–2025)
Source: Author's own contribution

With several noteworthy articles each, IEEE Access, Telecommunications Policy, and Computer Networks are the most pertinent journals in this field. The distribution of publications by journal and their quartile classification (Q1–Q4) are shown in Table 1. Publications in this field of study are highly visible and of high quality, as evidenced by the strong dominance of Q1 journals.

Table 1: Main sources of publication and Scopus quartile ranking

Source	Articles	Quartiles
IEEE Access	7	Q1
IEEE Transactions on Network and Service Management	5	Q1
Computer Communications	4	Q1
IEEE Communications Magazine	4	Q1
Future Generation Computer Systems	3	Q1
Computer Networks	3	Q1
Multimedia Tools and Applications	3	Q2
Transactions on Emerging Telecommunications Technologies	2	Q2
Wireless Personal Communications	2	Q2
Photonic Network Communications	1	Q3
Information and Software Technology	1	Q1
IEICE Transactions on Information and Systems	1	Q4

Source: Authors' own research

The most cited articles are listed in Table 2 according to citation impact. Works by Alsharif et al. on QoS/QoE in 5G networks and Gupta and Momaya on service quality evaluation are influential. These contributions demonstrate the field's interdisciplinary nature, where management-oriented viewpoints coexist with engineering-focused research. This result is in line with hypothesis H2, which postulated that multidisciplinary efforts would have the biggest influence.

Table 2: Most cited articles in the field (2000–2025)

Global level			
Authors	Year	Title	Objective
Zhang C.; Patras P.; Haddadi H.	2019	Deep Learning in Mobile and Wireless Networking: A Survey	To analyze the application of deep learning in mobile networks
Imran A.; Zoha A.	2014	Challenges in 5G: How to empower SON with big data for enabling 5G	Optimization of SON for 5G using big data
Zhou X.; Li R.; Chen T.; Zhang H.	2016	Network slicing as a service: Enabling enterprises' own software-defined cellular networks	Proposal of a slicing-as-a-service model
Wang Y.; Feng W.; Wang J.; Quek T.Q.S.	2021	Hybrid Satellite-UAV-Terrestrial Networks for 6G Ubiquitous Coverage: A Maritime Communications Perspective	Hybrid architecture for 6G coverage
Kang K.-D.; Son S.H.; Stankovic J.A.	2004	Managing deadline miss ratio and sensor data freshness in real-time databases	Managing latency in real-time sensor databases
Jdid B.; Hassan K.; Dayoub I.; Lim W.H.; Mokayef M.	2021	Machine Learning Based Automatic Modulation Recognition for Wireless Communications: A Comprehensive Survey	Automatic modulation recognition using ML
Dieye M.; Ahvar S.; Sahoo J.; Ahvar E.; Glitho R.; Elbiaze H.; Crespi N.	2018	CPVNF: Cost-Efficient Proactive VNF Placement and Chaining for Value-Added Services in Content Delivery Networks	Efficient placement of virtual network functions
Zuo Y.; Wu Y.; Min G.; Huang C.; Pei K.	2020	An Intelligent Anomaly Detection Scheme for Micro-Services Architectures with Temporal and Spatial Data Analysis	Anomaly detection in micro-services
Mubeen S.; Asadollah S.A.; Papadopoulos A.V.; Ashjaei M.; Pei-Breivold H.; Behnam M.	2018	Management of Service Level Agreements for Cloud Services in IoT: A Systematic Mapping Study	SLA management in IoT cloud services
Choi S.; Park K.; Kim C.-K.	2005	On the performance characteristics of WLANs: Revisited	WLAN performance analysis
Local level			
Martinez M.P.; László T.; Pataki N.; Rotter C.; Szalai C.	2018	Multivendor deployment integration for future mobile networks	Integration of multivendor mobile networks
Moon S.; Oo T.Z.; AhsanKAZMI S.M.; Park B.J.; Hong C.S.	2017	SDN-based self-organizing energy efficient downlink/uplink scheduling in heterogeneous cellular networks	Energy efficiency optimisation in heterogeneous cellular networks
Pedersen K.; Pocovi G.; Steiner J.; Maeder A.	2018	Agile 5G Scheduler for Improved E2E Performance and Flexibility for Different Network Implementation	Optimization of 5G scheduling
Gomes A.S.; Sousa B.; Palma D.; Fonseca V.; Zhao Z.; Monteiro E.; Braun T.; Simoes P.; Cordeiro L.	2017	Edge caching with mobility prediction in virtualized LTE mobile networks	Content delivery optimization in virtualized LTE

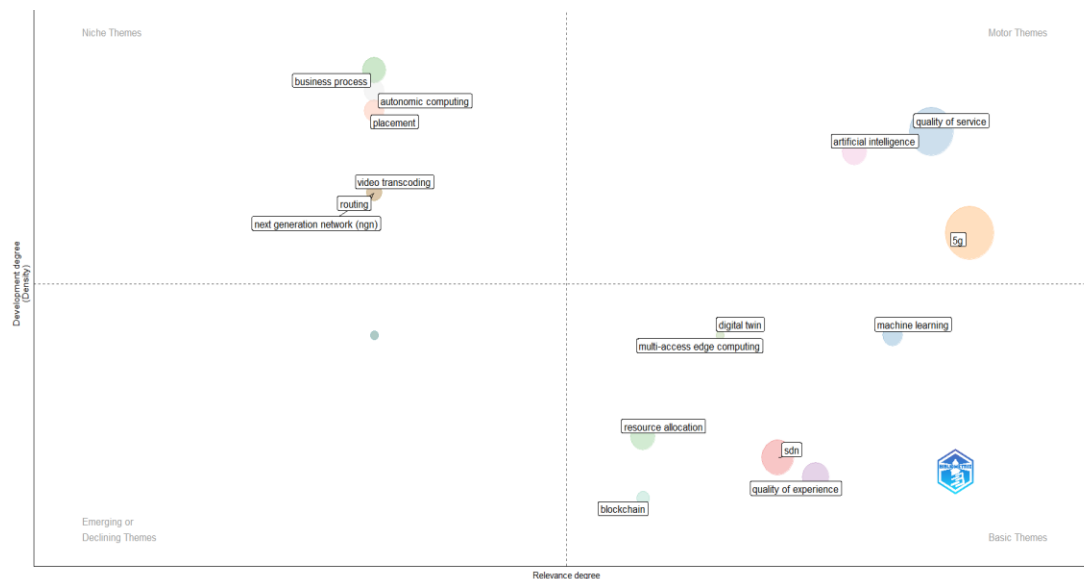


Figure 4: Thematic map of research in mobile telecom service quality (2000–2025)

Source: Author's own contribution

The findings support each of the three hypotheses put forth. First, there is a discernible shift in the literature from studies that focused primarily on QoS to those that focused on QoE and user experience (H1). Second, interdisciplinary contributions that integrate engineering, service management, and user psychology are in fact the most influential (H2). Lastly, in line with H3, recent publications emphasise the growing prevalence of themes like AI, Agile frameworks, and quality assurance in 5G/6G networks.

QoS, AI, and 5G are mature motor themes that are critical to the development of 6G in the future. Although they are still in their infancy, the fundamental themes of blockchain, QoE, and machine learning are highly pertinent. Emerging topics like edge computing and digital twins are novel and are predicted to become more significant. Although they are still specialised, niche themes like autonomic computing and business processes have potential in interdisciplinary settings.

These results highlight the field's dual focus: implementing user-centric models and agile management techniques while also optimising network infrastructure for technical efficiency. The wider evolution of telecommunications into a socio-technical system that necessitates both engineering prowess and customer-focused tactics is reflected in this duality. Though they are still relatively minor in the literature, emerging themes like edge computing and digital twins have a significant impact on how the 6G era develops. The fact that these themes are low-density and low-centrality suggests that research is still in its infancy. Nonetheless, these subjects will probably become major themes in the upcoming ten years due to the anticipated expansion of autonomous systems, immersive applications, and smart logistics.

Conclusion

Important insights into the development of research on mobile telecommunications service quality can be gained from the bibliometric analysis of 177 publications that were indexed in Scopus between 2000 and 2025. The findings demonstrate the increasing importance of 5G and user-centric quality models by confirming a consistent rise in scientific output, especially after 2015, with a peak around 2021.

The interdisciplinary nature of research at the nexus of engineering and management is highlighted by the analysis of sources, which reveals that journals like IEEE Access, Telecommunications Policy, and Computer Networks dominate the field. Technical network performance (QoS) optimisation and user-centered service evaluation are the two complementary viewpoints that are the subject of the most cited articles.

Three main research clusters are revealed by the keyword co-occurrence network. The technical foundation of telecom quality research is represented by the first, which is focused on QoS, latency, and 5G performance. The second cluster, which reflects the move towards human-centric viewpoints, places an emphasis on QoE, user satisfaction, and service evaluation models. The third cluster, which denotes novel interdisciplinary approaches, is linked to AI integration, Agile methodologies, and service innovation. This evolution is further supported by

thematic mapping, which positions blockchain-enabled logistics, edge computing, and smart service design as emerging topics while QoS continues to be a motor theme and QoE and customer satisfaction serve as fundamental and cross-cutting themes.

The hypotheses developed in this study are supported by these findings. First, user-centered QoE and satisfaction have become the focus of research instead of network-centric QoS metrics. Second, interdisciplinary works that integrate management science, customer behaviour research, and telecommunications engineering have the greatest impact. Third, new avenues like artificial intelligence (AI), agile frameworks, and predictive quality models are quickly becoming more significant, particularly in the context of 5G and pre-6G. The research's practical implications underscore the necessity for telecom operators to coordinate technical investments in network performance with customer experience-focused managerial strategies. Businesses can improve customer loyalty, minimise service interruptions, and predict trends by utilising bibliometric foresight, implementing Agile in service management, and integrating AI-based monitoring.

Due to the analysis's exclusive reliance on Scopus-indexed documents, pertinent studies from other databases or industry sources might have been overlooked. Furthermore, the qualitative depth of findings is not captured by bibliometric indicators, which only record the quantitative and structural aspects of research. To get deeper insights, future research should enlarge the dataset, compare different databases, and incorporate text mining. All things considered, this study helps to map the intellectual terrain of mobile telecommunications service quality.

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