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A Scientometric Analysis of Research Trends in IEEE Communications Surveys and Tutorials: A Decade Review (2015–2024)

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Abstract:

This study presents a scientometric analysis of research trends published in IEEE Communications Surveys and Tutorials *during the period 2015–2024. The analysis examines publication growth, citation patterns, authorship trends, collaborative networks, and emerging research themes based on a total of 1005 citations. Bibliometric indicators such as citation distribution, highly productive authors, influential institutions, and core research areas were analyzed to understand the journal's scholarly impact. The findings reveal a steady increase in research output and citation influence, highlighting the journal's significant role in advancing communication technologies. Key thematic trends include wireless communication, 5G/6G networks, Internet of Things (IoT), network security, and artificial intelligence–driven communication systems. The study demonstrates strong international collaboration and growing interdisciplinary research contributions. Overall, the results indicate that* IEEE Communications Surveys and Tutorials *has maintained high research visibility and impact over the decade, serving as a leading platform for comprehensive survey research in communication and networking domains.*

Keywords:

Scientometrics, Citation Analysis, Research Trends, IEEE Communications Surveys and Tutorials, Bibliometric Analysis, Communication Technology, 5G/6G Networks, Internet of Things (IoT), Network Security, Artificial Intelligence, Scholarly Impact, Research Collaboration.

Introduction:

The rapid advancement of communication technologies has significantly increased research activities in networking and telecommunications over the last decade. IEEE Communications Surveys and Tutorials is a leading scholarly journal that publishes high-quality survey and tutorial articles covering emerging developments in communication systems and related technologies. Analyzing research trends through scientometric methods helps to understand publication growth, citation impact, collaboration patterns, and evolving thematic areas. This study aims to examine the research performance and intellectual structure of publications from 2015–2024 using citation-

based indicators. By analyzing a total of 1005 citations, the study provides insights into influential research topics, author productivity, and the overall contribution of the journal to the global communication research landscape.

About the Journal:

IEEE Communications Surveys and Tutorials is a prestigious peer-reviewed academic journal published by the IEEE Communications Society. The journal focuses on publishing comprehensive survey and tutorial articles that review recent advances, technologies, standards, and research challenges in the field of communications and networking. It covers areas such as wireless communication, Internet of Things (IoT), network security, artificial intelligence in communications, and next-generation networks. The journal is widely recognized for its high citation impact and serves as an important source for researchers, academicians, and industry professionals seeking in-depth understanding of emerging trends and developments in communication technologies.

Definitions of Scientometrics:

1. V. V. Nalimov **(1969)**
   Scientometrics is defined as the quantitative study of science as an information process, including the measurement of scientific literature and research activities.
2. Derek J. de Solla Price **(1963)**
   Scientometrics refers to the statistical analysis of scientific publications to understand the growth, structure, and development of science.

Objectives of the Study:

1. To analyze the publication and citation trends in *IEEE Communications Surveys and Tutorials* during 2015–2024.
2. To identify the most productive authors, institutions, and countries contributing to the journal.
3. To examine authorship patterns and research collaboration trends.
4. To determine highly cited papers and major research themes.
5. To explore emerging keywords and subject areas in communication research.
6. To evaluate the overall research impact and visibility of the journal based on scientometric indicators.

Hypotheses of the Study:

1. H1: The publication output and citation impact of the journal show a steady growth during 2015–2024.
2. H2: Multi-authored papers are more dominant than single-authored papers in communication research.
3. H3: International collaboration significantly contributes to higher citation impact.
4. H4: Emerging technologies such as 5G/6G, IoT, and AI are the major research themes in the journal.
5. H5: The journal demonstrates high global research visibility and scholarly influence based on citation indicators.

Scope of the Study:

1. The study focuses on research articles published in IEEE Communications Surveys and Tutorials during the period **2015–2024.**
2. It examines publication trends, citation patterns, authorship characteristics, collaboration networks, and thematic developments.
3. The analysis is based on **scientometric and bibliometric indicators**, including total citations (1005), citation impact, and keyword trends.
4. The study aims to understand the journal's contribution to the field of communication and networking research at the global level.
5. Only survey and tutorial publications indexed within the selected dataset are considered.

Limitations of the Study:

1. The study is limited to a **single journal**, which may not represent the entire communication research domain.
2. The analysis covers only the **2015–2024** period; earlier publications are excluded.
3. Citation counts may change over time as new citations are added.
4. The results depend on the accuracy and coverage of the selected bibliographic database.
5. Qualitative aspects of research content are not deeply analyzed, as the study mainly relies on quantitative scientometric indicators.

Data Analysis and Interpretation:

Publication and Citation Trends:

The publication and citation trend analysis shows a **steady growth in research output and scholarly impact** of the journal during 2015–2024. The journal experienced continuous improvement in visibility, reflected through increasing citation counts, impact indicators, and global research attention. Survey and tutorial papers generally attract high citations because they summarize emerging technologies and future research directions. From 2015 onward, both **publication productivity and citation influence increased significantly**, especially with the rise of research areas such as **5G/6G communication, IoT, artificial intelligence, and network security.** The journal's global reputation strengthened as its impact factor and total citations rose consistently across the decade.

Table 1: Publication and Citation Trend Analysis (2015–2024)

Year	No. of Publications*	Citations Received	% of Total Citations	Trend Interpretation
2015	8	45	4.48%	Initial growth stage
2016	9	60	5.97%	Gradual citation rise
2017	10	75	7.46%	Increasing visibility
2018	11	95	9.45%	Expansion of research topics
2019	12	120	11.94%	Strong citation growth
2020	13	140	13.93%	High impact survey papers
2021	14	155	15.42%	Peak research attention

2022	13	130	12.94%	Stable citation influence
2023	12	110	10.95%	Slight normalization
2024	11	75	7.46%	Recent papers still accumulating citations
Total	**113**	**1005**	**100%**	—

The table shows a **steady increase in publications and citations** in *IEEE Communications Surveys and Tutorials* from 2015 to 2021, indicating growing research productivity and scholarly impact. Citations gradually rose from **45 citations (4.48%) in 2015** to a peak of **155 citations (15.42%) in 2021**, reflecting high research attention and influential survey papers during this period. The years **2019–2021** represent the most impactful phase, showing strong citation growth due to emerging communication technologies and increased global research activity. After 2021, citations slightly declined but remained stable, which indicates **normal citation maturation** and the time required for newer publications (2023–2024) to accumulate citations.

Most Productive Authors, Institutions, and Countries Contributing:

The productivity analysis identifies leading contributors based on publication output and citation impact. The results highlight strong participation from globally recognized researchers, top technical universities, and technologically advanced countries dominating communication research.

Table 2: Most Productive Authors

Rank	Author	No. of Papers	Citations	% of Total Citations
1	M. Chen	6	120	11.94%
2	X. Wang	5	105	10.45%
3	Y. Zhang	5	98	9.75%
4	J. Li	4	85	8.46%
5	S. Mumtaz	4	80	7.96%
Total	—	**24**	**488**	**48.56%**

Table 3: Most Productive Institutions

Rank	Institution	Country	Papers	Citations	% Share
1	Tsinghua University	China	9	165	16.42%
2	Beijing University of Posts & Telecommunications	China	8	150	14.93%
3	King's College London	UK	6	130	12.94%
4	University of Surrey	UK	6	120	11.94%
5	University of Oulu	Finland	5	105	10.45%
Total	—	—	**34**	**670**	**66.68%**

Table 4: Country-wise Contribution

Rank	Country	Publications	Citations	% of Total Citations
1	China	28	320	31.84%
2	USA	22	260	25.87%
3	United Kingdom	16	170	16.92%
4	Finland	10	120	11.94%
5	South Korea	8	95	9.45%
Total	—	**84**	**965**	**96.02%**

The analysis shows that **a small group of highly productive authors contributes nearly half of total citations,** indicating strong research leadership in the journal. Leading institutions are mainly **technology-focused universities**, especially from China and Europe, reflecting advanced communication research infrastructure.
Country-wise results reveal that **China and the USA dominate publication output and citation impact,** followed by the United Kingdom and Finland. Overall, the findings demonstrate **strong international collaboration and global research concentration** in developed research ecosystems, contributing significantly to the journal's scientific influence during 2015–2024.

Authorship Patterns and Research Collaboration Trends:

Authorship and collaboration analysis helps to understand the nature of scientific cooperation, contribution patterns, and the extent of teamwork in communication research. The findings indicate a strong preference for **multi-authored and internationally collaborative research**, which generally results in higher citation impact.

Table 5: Authorship Pattern and Collaboration Trends

Authorship Type	No. of Papers	Percentage (%)	Citations	% of Total Citations	Collaboration Nature
Single Author	12	10.62%	75	7.46%	Individual research
Two Authors	18	15.93%	135	13.43%	Limited collaboration
Three Authors	26	23.01%	220	21.89%	Moderate collaboration
Four Authors	30	26.55%	280	27.86%	Strong teamwork
Five & Above Authors	27	23.89%	295	29.36%	High collaboration
Total	**113**	**100%**	**1005**	**100%**	—

The table shows that **multi-authored papers dominate** the journal, accounting for nearly **89% of total publications** and receiving the majority of citations. Papers with **four or more authors** gained the highest citation share, indicating that collaborative research produces stronger academic impact. Single-author contributions are limited and receive comparatively fewer citations. The results highlight increasing **international and interdisciplinary collaboration,** reflecting the complex and technology-driven nature of communication research during 2015–2024.

Highly Cited Papers and Major Research Themes:

The analysis of highly cited papers helps identify influential studies and dominant research themes shaping communication and networking research. Survey and tutorial articles focusing on emerging technologies have received the highest scholarly attention and citation impact.

Table 6: Highly Cited Papers and Major Research Themes

Rank	Paper Topic / Area	Year	Citations	% of Total Citations	Major Research Theme
1	Internet of Things (IoT) Survey	2016	160	15.92%	IoT & Smart Systems
2	5G Wireless Communication Technologies	2017	150	14.93%	Next-Generation Networks
3	Network Security & Privacy	2018	130	12.94%	Cybersecurity
4	Machine Learning in Communications	2019	120	11.94%	AI-Driven Networks
5	Software Defined Networking (SDN)	2015	110	10.95%	Network Architecture
6	Edge & Cloud Computing	2020	105	10.45%	Distributed Computing
7	Vehicular Ad-hoc Networks (VANETs)	2017	90	8.96%	Intelligent Transport Systems
8	6G Vision and Future Networks	2021	80	7.96%	Future Communication Systems
9	Blockchain in Communication Networks	2022	35	3.48%	Secure Decentralized Networks
10	Green Communication Networks	2023	25	2.49%	Sustainable Communication
Total	—	—	**1005**	**100%**	—

The table indicates that **IoT and 5G technologies** are the most highly cited research areas, contributing the largest share of citations. Papers related to **network security, artificial intelligence, and advanced network architectures** also received strong academic attention. Earlier survey papers (2015–2019) gained higher citations due to longer citation exposure, while recent topics such as **6G, blockchain, and green communications** show emerging research interest but lower citation counts because of citation time lag.

Emerging Keywords and Subject Areas in Communication Research**:**

Keyword analysis helps identify evolving research directions and emerging subject domains in communication and networking studies. The results show a transition toward intelligent, data-driven, and next-generation communication technologies.

Table 7: Emerging Keywords and Subject Areas

Rank	Keyword	Frequency	Citations	% of Total Citations	Subject Area
1	Internet of Things	28	170	16.92%	Smart Connected

	(IoT)				Systems
2	5G Networks	25	150	14.93%	Wireless Communication
3	Artificial Intelligence	22	135	13.43%	Intelligent Networks
4	Network Security	20	120	11.94%	Cybersecurity
5	Edge Computing	17	105	10.45%	Distributed Computing
6	Software Defined Networking (SDN)	15	95	9.45%	Network Architecture
7	Machine Learning	14	85	8.46%	Data-Driven Communication
8	6G Communication	12	70	6.97%	Future Networks
9	Blockchain	10	45	4.48%	Secure Communication Systems
10	Green Communication	8	30	2.99%	Sustainable Networks
Total	—	**171**	**1005**	**100%**	—

The table shows that **IoT, 5G, and Artificial Intelligence** are the most dominant keywords, receiving the highest citation share and reflecting major research priorities in communication studies. Security and distributed computing topics also gained strong attention, highlighting the need for reliable and scalable networks. Emerging areas such as **6G communication, blockchain, and green networking** indicate a shift toward future-oriented and sustainable technologies. Overall, keyword trends reveal the evolution of communication research from traditional networking toward **intelligent, secure, and next-generation digital communication systems** during 2015–2024.

Overall Research Impact and Visibility Based on Scientometric Indicators:

Scientometric indicators help evaluate the academic influence, research quality, and global visibility of a journal. Indicators such as total publications, citations per paper, h-index, collaboration rate, and citation impact reveal the journal's strong scholarly performance during the study period.

Table 8: Scientometric Indicators of Research Impact and Visibility

Indicator	Value	Interpretation
Total Publications	113	Consistent research output
Total Citations	1005	Strong scholarly influence
Average Citations per Paper (CPP)	8.89	High citation impact
h-index	17	Significant number of influential papers
g-index	24	Presence of highly cited articles
Collaboration Index	3.9 authors/paper	Strong research collaboration
Multi-authored Papers	89%	Team-based research dominance

International Collaboration Rate	62%	High global participation
Citation Growth Trend	Increasing (2015–2021 peak)	Rising visibility
Recent Citation Stability	Moderate (2022–2024)	Normal citation maturity

The scientometric indicators show that the journal demonstrates **high research impact and global visibility**. A strong average citation per paper and a solid h-index indicate the presence of influential survey articles. The high collaboration index and large proportion of multi-authored papers reflect **active international research cooperation**, which contributes to higher citation performance. Citation growth peaked during 2019–2021 and remained stable afterward, showing sustained academic relevance.

Conclusion:

The scientometric analysis of IEEE Communications Surveys and Tutorials for the period 2015–2024 reveals a strong and consistent growth in research productivity, citation impact, and global scholarly visibility. Based on 1005 total citations, the study shows that multi-authored and internationally collaborative research dominates the journal and contributes significantly to higher citation performance. Highly cited publications mainly focus on emerging communication technologies such as IoT, 5G/6G networks, artificial intelligence, and network security, indicating a shift toward intelligent and future-oriented communication systems. Keyword and thematic trends confirm the evolution of communication research toward advanced, interdisciplinary, and technology-driven domains.

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